

Preparation Standards for Legacy Engineering Drawings

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-09RL14728



P.O. Box 650
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Mission Support Alliance

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APPROVED
By Sarah Harrison at 9:04 am, Oct 13, 2020

Release Approval

Date

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**DATE:
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Preparation and CAD Data File Standards for Legacy Engineering Drawings

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1.0 PURPOSE

This standard documents basic requirements for preparation, release, revision, and control of computer aided drafting (CAD) files of legacy engineering drawings. Legacy drawings are those that were prepared and entered into the Hanford drawing storage/retrieval system prior to establishing the new standard HNF-64001, *Preparation and CAD Data File Standards for Engineering Drawings*.

This legacy standard consolidates and updates previous Hanford drafting and Computer Aided Drafting (CAD) standards, including:

- HNF-PRO-709, *Preparation and Control Standards For Engineering Drawings*
- HNF-22999, *CAD Data File Standards for Engineering Drawings*
- HNF-23000, *Preparation Standards for Engineering Drawings*.

2.0 SCOPE

This standard applies to revisions of engineering drawings created and entered into the Hanford drawing storage/retrieval system that used standards in effect prior to release of HNF-64001, *Preparation and CAD Data File Standards for Engineering Drawings*.

Existing drawings entered into and released from the Hanford Document Management and Control System (DMCS) may use the standards under which they were created for revisions.

New drawings are governed by HNF-64001, *Preparation and CAD Data File Standards for Engineering Drawings*.

Legacy drawings may be updated to the latest standard at the discretion of the drawing's Design Authority (DA).

Drawings used to provide temporary construction designs are exempt from these requirements except for those designed items that will be abandoned in place (e.g., direct buried electrical lines, potable water lines).

3.0 STANDARDS

3.1 Control of Original CAD Data Sets and Manual Drawings

Control of original drawings is managed by Mission Support Alliance (MSA) with DMCS. Drawings are released with the process as given in MSC-PRO-709, *CAD and Drawing Development and Control Process for Engineering Drawings*. Approved engineering drawings are transferred to DMCS. The AutoCAD data sets are transferred to site document control for input into the DMCS. The final hard copy engineering plotted

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drawing and the CAD data files (those with a “DWG” extension) are released concurrently into DMCS by document control, per MSC-PRO-709.

3.1.1 CAD Program

AutoCAD 2019 shall be used for preparing all engineering drawings that will be released into the Hanford drawing storage/retrieval system. Drawings developed on CAD programs other than AutoCAD shall be converted to the standard AutoCAD program “DWG” format prior to releasing the data files to DMCS. Final plots shall be generated from the .DWG format.

3.2 Drawing Categories

3.2.1 General

Drawings that document baseline information for structures, systems, and components are covered by this standard. They include several different drawing types, such as arrangement, assembly, process and instrumentation diagram (P&ID), loop sheet, envelope, and altered-item drawings. This list is not all-inclusive, and other types of drawings may be necessary for particular purposes.

These drawings are assigned unique H series drawing numbers. The H series drawing numbers are issued and controlled by Hanford Document Numbering System. These drawings are permanent records and are subject to as-built requirements at the completion of construction/fabrication. These drawings will require maintenance based on the life cycle of the depicted structure, system, and component.

SK series drawing numbers are no longer recognized. See Appendix A, “Guide to Historical Drawing Numbers.”

3.2.2 Vendor Drawings

H series vendor-supplied drawings that will be designated as design baseline shall meet the requirements of this standard. Vendor-supplied drawings not assigned H series numbers shall be submitted to DMCS in accordance with standard MSC-RD-PRO-1819.

An altered-item drawing shall be developed for vendor items that require modification as part of a design, or modification to items covered by a vendor item (VI) file. See definition in Appendix 7, Glossary, and Section 3.22.10, Altered Item.

3.3 Computer-Aided Drafting (CAD)

3.3.1 AutoCAD Discipline Layering Standards

Uniform layering standards are established to make it easier to exchange AutoCAD data sets among organizations and companies. Consistency allows logical separation and

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identification of drawing data, and permits the user to view and plot related aspects of a drawing separately or in combination.

3.3.1.1 Layering

Designating layers by color and linetype is the preferred standard. Layers can also be assigned on an entity basis. This section and Appendix B describe the standards to be used when assigning layers.

Drawing setup files (also identified in AutoCAD documentation as “prototype drawings”) establish specific discipline layers for routine use. Appendix B, “Layer Naming Standards,” Tables 1 through 9, cover the following:

- Table 1, General Layering for All Disciplines
- Table 2, Architectural Drawings
- Table 3, Civil/Structural/Environmental Drawings
- Table 4, Electrical Drawings
- Table 5, Fire Protection Drawings
- Table 6, HVAC Drawings
- Table 7, Instrumentation & Control (I&C) Drawings
- Table 8, Mechanical Drawings
- Table 9, Piping Drawings

For mapping and mapping related drawings, use the Hanford Graphical Information System (HGIS) layering standards.

Third-party software approved for use by MSA, with built-in layering standards, is exempt from this layering standard requirement. However, to support third-party software, a special plotter configuration may be required.

3.3.1.2 Layer Naming Standard

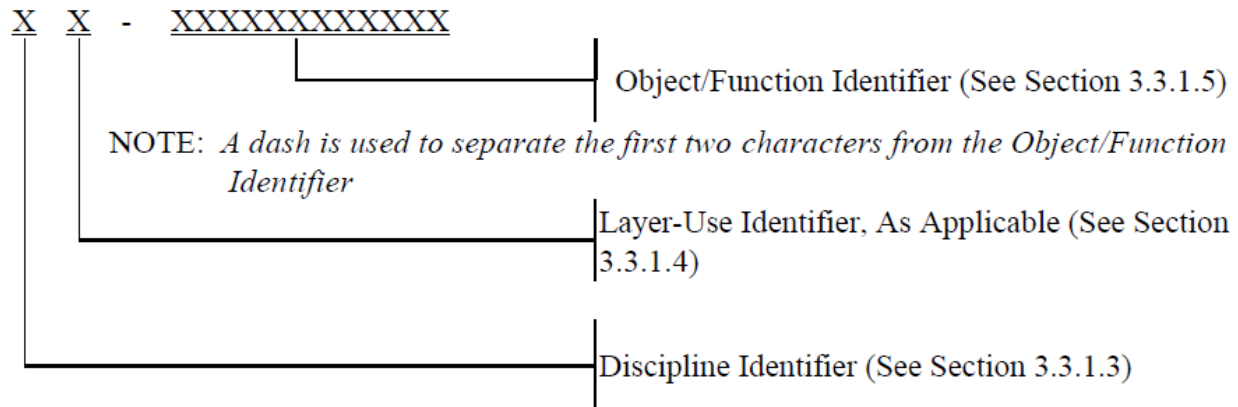
Figure 1 shows the layer-naming standard that shall be used on AutoCAD-developed drawings.

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Figure 1. Layer Naming Standard



3.3.1.3 Discipline Identifier

This identifier defines specific discipline. A unique identifier enables users to distinguish quickly discipline layers within a drawing file and provides a logical separation of discipline information, as defined by Table 1. Also, see Figure 1.

Table 1. Discipline Identifiers

Identifier	Discipline	Identifier	Discipline
A	Architectural	H	HVAC
C	Civil	I	Control Systems
E	Electrical	M	Mechanical/Machine
F	Fire Protection	P	Piping
G	General (non-specific applications)	S	Structural

3.3.1.4 Layer-Use Identifier (As Applicable)

The layer-use identifier designates what the layer depicts (e.g., primary objects, existing equipment, hidden objects, or text). The layer-use identifier is used only when a single linetype and color is assigned to an individual layer as defined by Table 2. Also, see Figure 1. Normally, this identifier is not used for entity-based layers.

Table 2. Layer-Use Identifiers

Identifier	Layer-Use	Linetype
O	New or main object, visible lines, primary line work	Continuous
E	Existing equipment - For A/E use to depict existing facility/equipment	Phantom
F	Future items - For A/E use to depict future items	Dashed

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D	Demolition - For A/E use to depict demolition information	Dashed
T	Text	Continuous
M	Dimensioning	Continuous
C	Center lines	Center
H	Hidden items/lines	Hidden
X	Hatching	Continuous
P	Mechanical details depicting repeated details (e.g., spring and screw thread details or alternate positioning of absent parts)	Phantom
V	Viewing and Cutting Planes	Varies

Certain conditions may make it desirable to link layer data together but still keep the data separate. For example, if a piping modification required new equipment to be installed after the old equipment is removed, the layer-use identifier could be used to separate data as follows:

- PE-PIPING - Existing piping
- PD-PIPING - Piping to be removed (demolition)
- PO-PIPING - New piping to be installed
- PF-PIPING - Piping to be considered for future installation.

3.3.1.5 Object/Function Identifier

The object/function identifier provides a semi-descriptive name of layer contents or function. The identifier may be as many as 28 characters in length and may contain letters, numerals, and special characters, such as \$ (dollar), - (hyphen), and _ (underscore). See Figure 1 and Appendix B, Tables 1 through 9.

When words used in the object/function identifier are abbreviated, use of the latest edition of American Society of Mechanical Engineers (ASME) Y1.1, Abbreviations for Use on Drawings and in Text, is recommended.

3.3.1.6 Plotter Pen Assignments

Plotters are configured to produce line widths based on colors. Designating specific AutoCAD colors to the plotter pens does this. This allows specific line weights to be generated by the plotter and minimizes the need to use AutoCAD Polylines for all line work within a drawing.

Care should be taken to ensure the selected color/line weight produces the desired line width on the final drawing plot. The linetype and color should provide the optimum contrast with the visible/object line width on the drawing. See Figure 4 for available plotter line widths.

NOTE: Selecting the Polyline feature will limit the minimum Polyline width to the plotter line width that is established by the line color.

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Table 3. Plotter Pen Assignments

Pen No. 1 0.25mm (0.010in.)	Pen No. 2 0.35mm (0.014in.)	Pen No. 3 0.5mm (0.020in.)	Pen No. 4 0.7mm (0.028in.)	Pen No. 5 0.95mm (0.038in.)
Color Assignment	Color Assignment	Color Assignment	Color Assignment	Color Assignment
Primary Color	Primary Colors	Primary Color	Primary Colors	Primary Color
8 (8)	5 (Blue) 6 (Magenta) 7 (White)	4 (Cyan)	2 (Yellow) 3 (Green)	1 (Red)
Optional Colors	Optional Colors	Optional Colors	Optional Colors	Optional Colors
X3 (e.g., 13, 53, 123, 243)	X2 (e.g., 12, 32, 152, 222)	X1 (e.g., 11, 71, 181, 241)	X0 (e.g., 10, 90, 100, 230) X5 X6 X7 X8 X9	X4 (e.g., 14, 64, 134, 214)

3.3.1.7 New-Drawing Setup Files

New-drawing setup files, also identified in AutoCAD documentation as Prototype or Template drawings, are defined using this layering convention. See Appendix B, “Layer Naming Standards,” Tables 1 through 9.

The startup files are not all-inclusive of required layers. Additional layers may be created as needed to provide for specific drawing needs. The specified naming standard described here is to be used to develop additional layers.

3.3.1.8 Layering Modification

Anyone may request additions or revisions to the Hanford Site discipline-layering standard. A request for changes must be submitted to MSA in writing. The request must provide justification and specific changes.

3.3.2 X-Reference Files

Prior to submitting files to DMCS, X-Reference files must be bound to the AutoCAD “DWG” drawing file. See definition of X-Reference in Appendix G, “Glossary”. All affected layers shall be changed to reflect the layering requirements, see Section 3.3.1.

3.3.3 Manual Modification or Revision of CAD-Generated Drawings

When a drawing is released, the CAD data set must reflect the released drawing. If a CAD-generated plotted drawing is changed (e.g., field of the drawing is changed) before

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it is issued, then the CAD data set shall be updated to reflect the changes before issuing the drawing to DMCS for release.

All manual changes shall be initialed and dated by the person making the changes. The engineer shall add, sign, and date a note stating that the manual changes to the drawing have been incorporated into the CAD data set. The note is placed above the Title Block on the drawing.

Engineering Change Notices incorporated into a released drawing requiring a manual change or alteration as a result of lost or corrupted CAD data sets, where the data set cannot be corrected, shall have a note added to the drawing stating the drawing is a manual drawing. The words "MANUAL DRAWING" shall be placed above the title block in 1/2" high lettering. This signifies the drawing has been manually updated and the data set is not available for updating.

3.3.4 Third-Party CAD Software

Third-party software used in the development of AutoCAD-based drawings shall be the type that does not require access to the third-party software to revise the drawings.

3.3.5 Shape Files and Non-Standard Fonts

Data sets of released engineering drawings shall not use nonstandard shape files and fonts (i.e., font files not supplied by AutoCAD). See Section 3.19, Lettering.

3.3.6 CAD Auxiliary Support Files/Information

Auxiliary support files/information are available on request through MSA. The available files and information are:

- Drawing start models (AutoCAD prototype/template drawings)
- Drawing Title Block formats
- Symbol libraries (e.g., architectural, electrical, control systems; heating, ventilation, and air conditioning [HVAC]; and P&ID). See Section 3.16.

3.4 Drawing Sizes

Drawings shall be sized in accordance with American National Standards Institute (ANSI) Y14.1-1980 (R1987), Drawing Sheet Size and Format, or ANSI Y14.1M-1992, Metric Drawing Sheet Size and Format, as applicable.

Use of the International Standards Organization (ISO) standard paper sizes is optional. The ANSI "F" size drawing (28" x 40") is the preferred inch size. The ISO "A1" size drawing (594 mm x 841 mm) is the preferred metric size. The ANSI "E" size, ISO "A0" size, and roll or elongated size drawings may be used with the authorization of the MSA drawing standards technical authority.

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3.5 Drawing Material

CAD drawing material shall be .75 to .80 mm or 3-mil minimum drafting film, matte on one side, or high quality rag vellum, 65 g/m2 (17 pound) minimum.

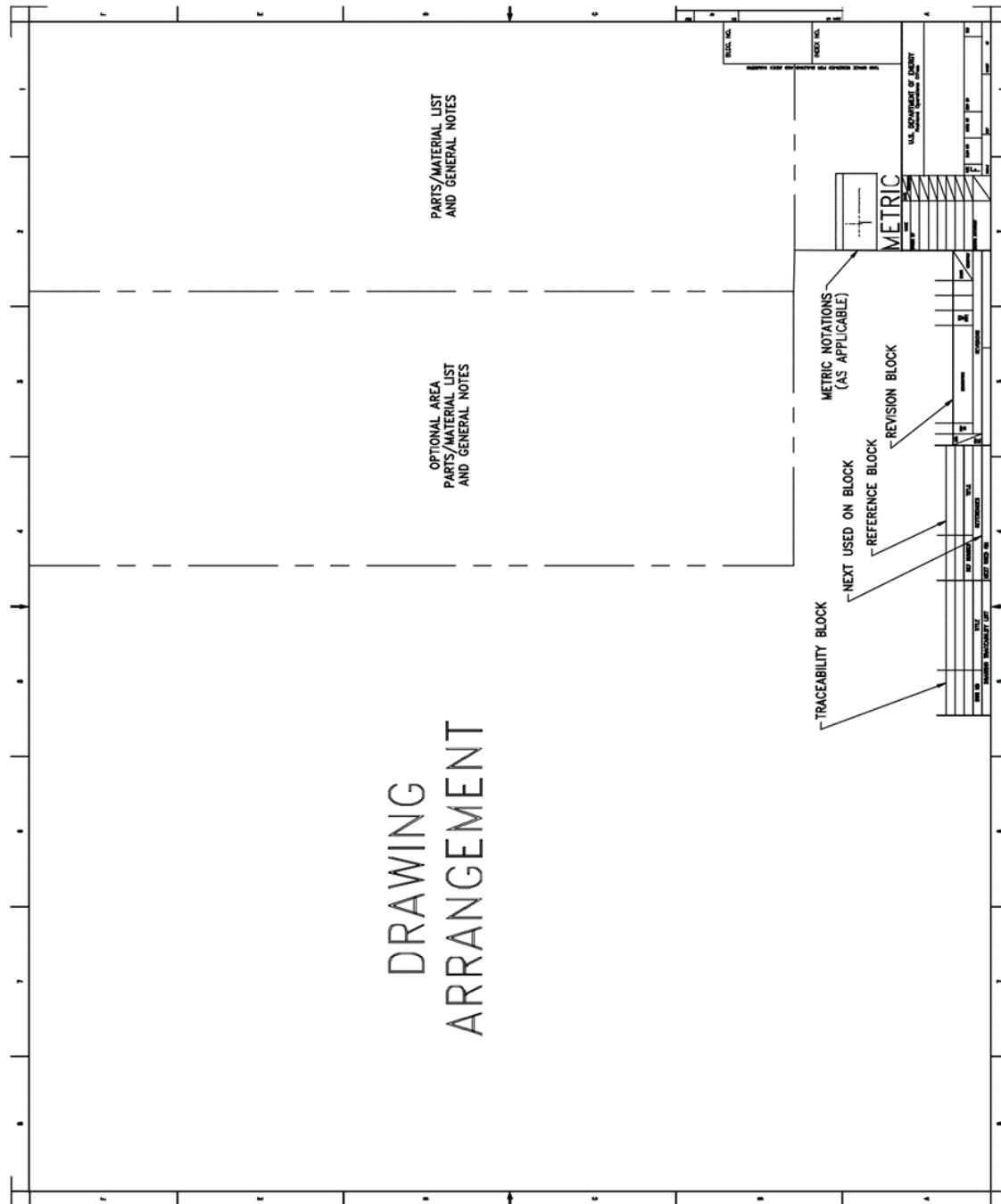
3.6 Drawing Arrangement

The general drawing arrangement shall conform to ANSI Y14.1-1980 (R1987) or ANSI Y14.1M-1992, as applicable, except for the location of the parts/materials list and the REVISIONS Block. Drawing arrangement shall be configured as shown in Figure 5 and as defined in this standard.

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Figure 5. Block Locations and Drawing Arrangement

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3.7 Title Block

Standard, discipline specific, AutoCAD start models developed for Hanford Site drawings shall be used (e.g., AutoCAD prototype/template drawings). The start models are available through MSA.

The CADFILE and CADCODE shown on older title blocks are no longer required and are to be left blank on new drawings entering the drawing system for initial release. Also, see Section 3.25.4.

3.7.1 Title Block Configuration

The Title Block shall conform to ANSI Y14.1-1980 (R1987) or ANSI Y14.1M-1992, except as defined by this standard. Additional spaces in the Title Block have been reserved for unique items. A complete Title Block is required for each drawing sheet (i.e., the second sheet drawing format per ANSI Y14.1-1980 shall not be used). Contents identified in the Title Block are modified to adapt to Hanford Site requirements. See Figure 6. Only one standard title block shall exist in any dataset. The title block may be inserted in Model Space or Paper Space.

Figure 6. Typical Title Block

NAME		DATE	COMPANY		U.S. DEPARTMENT OF ENERGY Richland Operations Office				
AUTHORITY		SIZE	BLDG NO	INDEX NO	DWG NO	REV			
		F							
SCALE			EDT		SHEET		OF		
2					1		GTITLE3 DWG (03-99)		

3.7.2 Company Name

The acronym of the contractor for each identified name shall be placed in the block next to the name and date. See Figure 6. For A/E contract drawings, the name of the firm may be placed above the Title Block.

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3.7.3 Drawing Title

- The title shall clearly identify the subject matter.
- The title shall not include capitol project numbers or building numbers (e.g., W-120).
- The area number shall be used only for area-wide presentations.
- The total number of characters, including spaces, shall not exceed 60.
- Height of the lettering in the title shall be a minimum of 6 mm (.24") for ISO A1 and ANSI D and F size drawings. Height of the lettering shall be 3 mm (.12") for all other drawings.
- Titles shall be arranged in one, two, or three lines centered in the block. All sheets of multiple-sheet drawings shall have the same title, except that the last line of the title may differ to describe the contents of each sheet.
- For capital projects, the project number and project title are entered in a supplemental block above the Title Block. See Figure 7.

Figure 7. Capital Projects Title Block

PROJECT				
U.S. DEPARTMENT OF ENERGY				
Richland Operations Office				
(COMPANY/CONTRACTOR NAME)				
SIZE F	BLDG NO	INDEX NO	DWG NO	REV
SCALE		EDT	SHEET	OF

3.7.4 Building Number

The building or area number shall be noted in the Title Block. Existing Hanford Site building numbers are controlled by the Hanford Facilities CORE.

If more than 12 buildings are depicted within the same area, the assigned building number shall be the area number followed by the letter G (e.g., 200G and 400G).

If additional space is required, the additional building number(s) shall be listed above the Title Block in the block provided, see Figure 5.

Off-site A/Es obtain building numbers from the appropriate contractor's point of contact.

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3.7.5 Index Number

3.7.5.1 Index Number Standard

HNF-23001, *Index Number Standard for Engineering Drawings*, describes the system that uses numerical digits to identify Hanford Site drawings for storage and retrieval purposes. All drawings developed shall be indexed in accordance with this standard. Index numbers are required on each drawing. The number shall be shown on the Title Block of each drawing before releasing the drawing into the Hanford drawing system.

Index numbers are listed in Appendix C, "Index Number System for Engineering Drawings, Alphabetic Listing" and Appendix D, "Index Number System for Engineering Drawings, Numeric Listing." An index number shall be assigned for each major category covered by the drawing. Nonessential numbers are not shown (e.g., 0801 and 0802 are not shown along with 0800 on a single drawing).

If additional space is required, the additional Index number(s) shall be listed above the Title Block in the in the block provided, see Figure 5.

Off-site A/Es obtain index numbers from the appropriate contractor's point of contact.

3.7.5.2 Index Number Usage

Existing drawings entered into and released through DMCS have index numbers assigned. These existing index numbers generally will not change based on modification or revision of the existing drawing. In the event that a new index number is required for an existing drawing, the index number may be generated per the newest standard in effect at the time of the change, or the standard in effect at the time of original drawing creation may be used. Refer to legacy documents HNF-22999, HNF-23000, and HNF-23001 for additional information on legacy application of index numbers.

3.7.5.3 Index System

The complete index number comprises four or six numerical digits. The first two digits identify the primary subject (i.e., 00 to 99). The next two digits identify the sub-category or secondary information (i.e., 01 to 99). The last two digits cover a further breakdown, if needed, of the information or tertiary subject (i.e., 01 to 99). An index number will have a minimum of four digits (e.g., 0804, Architectural Equipment Locations), or if the subject requires a further breakdown, the index number may require six digits (e.g., 590315, Control Systems, Wiring Diagrams, Safety Circuits).

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3.7.5.4 Primary Subjects

The primary subject names and corresponding index numbers are given in Table 4.

Table 4. Primary Subjects

Index Number	Subject
0	- Listing or Index
01 through 07	- Civil
08 through 14	- Architectural and Structural
15 through 58	- Mechanical
59 through 64	- Instrumentation
65	- Electronics
70	- Flow Diagrams
71 through 81	- Electrical
82	- Insulation and Heat Tracing
83	- Future
84 through 88	- Piping
89	- Heating, Ventilating, and Exhaust
90	- Air Conditioning Systems
91 through 98	- Future
99	- Miscellaneous Equipment not Identifiable or Related to Assembled Equipment

3.7.5.5 Secondary Subjects

The primary subjects are divided further into details or secondary subjects (e.g., 0804, Architectural Equipment Locations, or 7005, Piping and Instrument Diagram Closed Loop System [CLS]. The 04 and 05 digits are added to denote the details). See Appendices C and D.

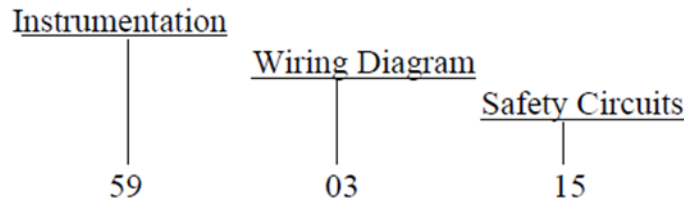
3.7.5.6 Tertiary Subjects

The tertiary subjects, containing two digits, are used only in conjunction with the primary subjects and secondary subjects, 49, 50, 59, 60, and 85, to indicate the type of drawing. The complete six-digit index number for a drawing showing a wiring diagram for safety circuits would be:

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The number is written as 590315. See Appendices C and D.

3.7.5.7 Multiple Index Numbers

In some instances a drawing may contain two or more index categories (e.g., Cranes [3900] and Electrical Power Plans [7301]). In these instances, index numbers shall be placed in the Title Block.

If additional space is required, the index numbers shall be listed above the Title Block in the Drawing Status area of the drawing. A notation shall be placed in the INDEX NUMBER block referencing the drawing zone location of the INDEX NUMBER list (e.g., SEE ZONE A1; SEE ZN 1A).

3.7.5.8 Assignment of New Index Numbers

Spare numbers are retained throughout the index number system for future expansion. Requests for new or additional index numbers are to be submitted in writing to MSA. New numbers are NOT to be used without approval.

3.7.6 Drawing Number

The drawing number shall be 6 mm to 8 mm (.24" to .35") high. Numbers are obtained from Hanford Document Numbering System (HDNS), or from the appropriate contractor's point of contact, as appropriate.

Drawing numbers are assigned in accordance with the Hanford Site area that the drawing represents, as shown in Table 8.

Table 5. Areas Represented by Drawing Prefixes

Drawing Prefix	Area
H-1	100 Area
H-2	200 Area
H-3	300 Area
H-4	400 Area; Fast Flux Test Facility (FFTF)
H-5	Unassigned except for electrical drawings not specifically applicable to other areas
H-6	General area, not included in other defined areas, usually civil drawings and maps

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H-7	700 Area and City of Richland (RCHN, RCHC, and RCHS)
H-8	800 Area, Exploratory Shaft Site
H-9	Specification Control Drawings
H-10	NOT USED
H-11	1100 Area (Area designation no longer used. This area is now City of Richland.)
H-12	3000 Area (Area designation no longer used. This area is now City of Richland.)
H-13	General mapping of the Hanford Site
H-14	Waste Tank Farm (200 East, 200 West, transfer lines, and associated electrical and instrumentation)

Note: The 1100 and 3000 area designations are no longer used and therefore no new H-11 and H-12 drawing numbers are issued. These former areas are now considered City of Richland, and thus new drawings use an H-7 number. Existing H-11 and H-12 drawings may be revised, including adding new sheets if necessary, using the existing drawing number and this standard.

For historical drawing number information, see also Appendix A, "Guide for Historical Drawing Numbers."

3.7.7 Revision Number

Numeric revision numbers shall be used. The current revision number is noted in the Title Block, as well as in the REVISION block. See Figures 6 and 15. Zero (0) is normally used for the initial release. Also, see Section 3.25.

3.7.8 Scale

Enter predominant scale of the drawing.

-Or-

If the predominant scale of the drawing cannot be determined, enter "SHOWN" and identify the scale under each graphic.

-Or-

Enter "NONE" when no scale is used.

3.7.9 Sheet Number

For single sheet drawings, a "1" shall be entered in the SHEET block. For multiple-sheet drawings, the sheets shall be numbered in sequence starting with 1.

Enter the total number of sheets on sheet 1 only. Each subsequent sheet shall show only the next sequential sheet number.

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3.7.10 Drawn By

The initials and surname of the originator shall be printed.

3.7.11 Approval Signatures

Approvals are in accordance with MSC-PRO-ENG-709, HNF-14660, or individual company procedures. Preprinted names are optional with signatures placed next to or above the preprinted names. If preprinted names are not placed in the block, the signature shall be legible.

The Design Authority (DA), as specified in MSC-PRO-ENG-20051, shall sign and date the Title Block in the bottom approval space. See Figure 8 below. The Design Authority's approval signifies all necessary reviews and approvals are complete and the drawing is to be entered into the Hanford drawing system. The company designator shall be identified in Title Block. Where the Design Authority is not preprinted, adding the Words "Design Authority" to the block is optional.

Figure 8. Design Authority

DESIGN AUTHORITY	SIZE	BLDG NO	INDEX NO
	F		
	SCALE	EDT	

2

3.8 References Block

3.8.1 Construction or Definitive Design

The drafting standard used to develop the drawing shall be listed in the "REFERENCES" section of the drawing. Additionally, reference documents needed by construction contractor may appear the references block (e.g. specifications, etc.). Vendor Information File number of supplied/existing equipment is referenced, if applicable. New drawings depicting new construction or definitive design are not listed in the REFERENCES block, but are shown on the drawing for continuation. The reference document number is entered in the REF NUMBER field. The reference document title is entered in the TITLE field and may be abbreviated.

Typical Reference Block

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HNF-64101	PREPARATION STANDARDS FOR ENGINEERING DRAWINGS	M
REF NUMBER	TITLE	REV
REFERENCES		REL
NEXT USED ON		C

4

3.8.2 Reference Document Number and Title

The reference document number shall be entered in the REF NUMBER block. See Figure 9. The actual title is entered in the TITLE block and may be abbreviated.

Figure 9. Typical Reference Block

		MFD
REF NUMBER	TITLE	REV
REFERENCES		REL
NEXT USED ON		

4

3.9 Next Used On Documentation

The NEXT USED ON block is used to document drawings that are linked together (e.g., a subassembly, detail and installation drawings). See Figure 9. These drawings shall be linked by referencing the next higher level or generation (e.g., a subassembly drawing will list the drawing number of the assembly or the installation drawing), as allocated. If the drawing is the top drawing, the words “END ITEM” are entered.

3.10 Drawing Traceability List

The DRAWING TRACEABILITY LIST block itemizes the existing drawings affected by changes in design. See Figure 10. All affected drawings shall be shown. The drawings are not to be duplicated in the REFERENCES block. All drawings are required to provide two-way traceability. See definition in Appendix G, “Glossary”.

Figure 10. Drawing Traceability List

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		REF NU
DWG NO	TITLE	
DRAWING TRACEABILITY LIST		NEXT USED O

3.11 General Notes

The preferred location of the general notes is above the Title Block. Other locations may be used when additional space is required. On multiple-sheet drawings, general notes shall start on sheet 1, but may continue on subsequent sheets, as necessary.

3.12 Drawing Status Area

A space approximately 75 mm (3") high above the Title Block shall be reserved on the drawing for recording additional Title Block information and for the application of A/E stamps according to individual contractor procedures.

3.13 Parts/Material List

The parts/material list shall be located, or begin, in the upper right-hand corner on the first sheet of the drawing. See Section 3.22 for parts/material list requirements.

3.14 General Practice

Drafting shall be according to applicable ASME/ANSI Y14 series and nationally accepted standards and practices.

3.15 Abbreviations and Acronyms

3.15.1 Abbreviations

Abbreviations shall conform to the latest edition of ASME Y1.1, Abbreviations for Use on Drawings and in Text, except where commonly accepted industry or specific discipline usage dictates a deviation from ASME Y1.1.

Abbreviations on a drawing shall be used only when space does not permit the word(s) to be spelled out, such as in the drawing title, parts list, or a reference drawing list. Industry-accepted abbreviations, such as DIA, SCH, and REF are to be used to the fullest extent. The face of the drawing should be planned and drafted to provide ample space so that abbreviations can be held to a minimum, for clarity and interpretation.

Punctuation marks, except the slant (/) and the hyphen (-), are not to be used when abbreviations are used on drawings. A period (.) shall be added to an abbreviation only if its context does not obviously represent an abbreviation (e.g., ADD indicates addition or

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addendum). Duplicate abbreviations are specified in the latest edition of ASME Y1.1. Before such abbreviations are used, care should be exercised to ensure the proper meaning is correctly interpreted.

3.15.2 Acronyms

The use of acronyms for industrial and professional societies (e.g., ASME, ANSI, AWS [American Welding Society], and IEEE [Institute of Electrical and Electronic Engineers]) is acceptable. These professional societies' acronyms are used at all times in text and on the field of the drawing.

Non-industry-accepted acronyms should be avoided. However, if repeated use of a word in text (e.g., general notes) makes the use of an acronym an obvious advantage, the acronym may be created. Hanford Site- specific acronyms shall be clearly defined by spelling out the acronym in the LEGEND or by using a general note.

3.16 Symbology

Symbology used on drawings that defines components shall be traceable, as applicable, to an engineering drawing or a LEGEND placed on the drawing. See Mandatory Symbology, Section 3.16.1. If additional symbology is required which is not covered by the mandatory symbology listed below, industry accepted standards will be used to the fullest extent possible with the symbology placed in a LEGEND on the drawing. Symbols used with the metric system (e.g., mm, Pa) need not be identified or referenced

For additions or modifications of Hanford symbology. See Section 3.16.3.

3.16.1 Mandatory Symbology

In order to maintain uniformity of drawing symbology, drawings generated for use at the Hanford Site shall comply with the symbology specified by the following drawings. These drawings and their applicable revision number are referenced for interpretation of components, as applicable, on all new drawings.

- H-6-14987 Hanford Standard, HVAC Symbology
- H-6-14988 Hanford Standard, Fire Protection Symbology
- H-6-14989 Hanford Standard, Control Systems Symbology
- H-6-14990 Hanford Standard, Electrical Symbology
- H-6-14991 Hanford Standard, Piping Symbology

Copies of these drawings are available through the contractor point of contact or MSA. AutoCAD symbol libraries are available through MSA.

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3.16.2 Optional Symbolology

The symbolology specified by the following drawings is optional. It is provided as a drafting aid to increase efficiency in producing drawings. The symbolology shown is preferred, but not mandatory.

- H-6-14982 Hanford Standard, General Symbolology
- H-6-14983 Hanford Standard, Civil Symbolology
- H-6-14984 Hanford Standard, Structural Symbolology
- H-6-14985 Hanford Standard, Architectural Symbolology
- H-6-14986 Hanford Standard, Machine Symbolology

Copies of these drawings are available through the contractor point of contact or MSA. AutoCAD symbol libraries shown on these drawings are available through MSA.

3.16.3 Creation or Modification of Symbolology Drawings

All requests for creation or modification of symbolology contained on drawings H-6-14982 through H-6-14991 shall be in writing and submitted to MSA for review, approval, and incorporation on the appropriate Hanford standard symbolology drawings.

3.16.4 Approved Symbolology Requests

Approved additions or modifications to Hanford standard symbolology, specified by H-6-14982 through H-6-14991, are completed through the standard drawing revision process. MSA arranges for new and modified items to be placed into the specific discipline Hanford CAD libraries. MSA notifies the requestor that the request has been approved for placement into a library.

The updated drawing(s) and engineering change notices are submitted to DMCS.

3.16.5 Non-Approved Symbolology Requests

If the request for a new symbol or revision to an existing symbol is not approved, MSA shall return a justification for rejection to the requester.

3.16.6 AutoCAD Symbol Naming Standards.

All AutoCAD symbolology shall comply with the naming standards listed in Appendix E, "Symbolology," Tables 1 through 10E.

3.17 Legibility

Drawings shall be prepared so prints are legible when reduced on microfilm and then re-enlarged. As an example, parallel lines shall have at least 1.5 mm (.06") spacing on the

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hard copy drawing to maintain distinction. The final released drawing shall be capable of passing a fifth-generation copy test. See definition in Appendix G, "Glossary".

3.18 Drawing List

The drawing list shall be placed on the first drawing in the project set of 20 or more drawings. The drawing list may be placed on a separate or title sheet. The list shall contain, as a minimum, the following information:

- Drawing numbers
- Drawing index number
- Building numbers (if more than one building is involved in the project)
- Title of each drawing
- Vendor information (VI) lists
- Specifications

For multiple-sheet drawings, the number of sheets may be shown without repeating the rest of the information (e.g., H-1-12345, SH 6), provided all the information is identical. When listing a specification or vendor information, the Hanford retrieval number shall also be listed next to the title.

3.19 Lettering

For CAD-developed drawings, lettering shall be all upper case Gothic as defined in ANSI Y14.2M, Line Conventions and Lettering (i.e., AutoCAD's supplied fonts ROMANS and ROMAND are considered to be in compliance with this requirement). Letter height will be minimum of 3 mm (.12"), except where lower case letters or metric symbols are standard (e.g., Na, mm, g). Lower case letters and symbols shall be proportional. A minimum height of 2.5 mm (.1") is allowed in cases where smaller letter height is required (e.g., mapping). Also, see Section 3.3.5.

3.20 Drawing Orientation

North shall be oriented to the top or left side of the sheet. Exceptions are allowed where modifications are being made to existing facilities for which the orientation of the existing drawings is different or where industry practices dictate (e.g., civil drawings showing plan view strips with corresponding profiles). All plans on a given set of drawings shall be oriented the same and match the existing plant drawing orientation. A north arrow shall be placed and properly oriented on all maps, plans, layouts, and other drawings where applicable.

3.21 Coordinate System and Geodetic Elevation Data

For new construction, the coordinates and elevation shall be as follows:

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Coordinates - The Washington Coordinate System of 1983, south zone (1991) (WCS83S[1991]). For additional requirements and definition, see Data Value Standard, Protocol Standard for "Plane Coordinates."

Elevation Data - The North American Vertical Datum of 1988 (NAVD88). For additional requirements and definition, see Data Value Standard, Protocol Standard for "Geodetic Elevation Data."

3.22 Parts/Material List

A parts/material list shall be used on fabrication and assembly drawings, but not on project construction drawings as specified in Table 6.

Table 6. Drawing Types and Classifications

ENGINEERING DRAWING TYPE	PARTS/MAT'L LIST NOT USED	FORMAL PARTS/MAT'L LIST, REQUIRED (See code key below)	MATERIAL CALL-OUT ON FIELD OF DRAWING (See code key below)
Architectural			All
Civil			All
Structural		1	2
Electrical		1-2-4	7
Piping		1-3-5	2
Instrumentation		1-2-3-4	7
Heating, Ventilation, and Air Conditioning		1-3-8	2-7
Mechanical		1	2
DRAWING CLASSIFICATION			
Fabrication		All	
Construction		6	All
Altered Item		1	2
Specification Control			All
Non-Fabrication/Construction, i.e., maps, conceptual layouts, cell arrangements, diagrams, schematics, wire run list, drawings made for operational use.	All		

Code Key for Table 6.

1. Fabrication or shop-oriented drawings
2. Construction field-installation-oriented drawings
3. In parts/material list description column, enter all pipe ells, tees, etc., as "size of pipe and miscellaneous fittings"
4. In parts/material list description column, enter all conduit lugs, pull boxes, etc., as required by National Electrical Code

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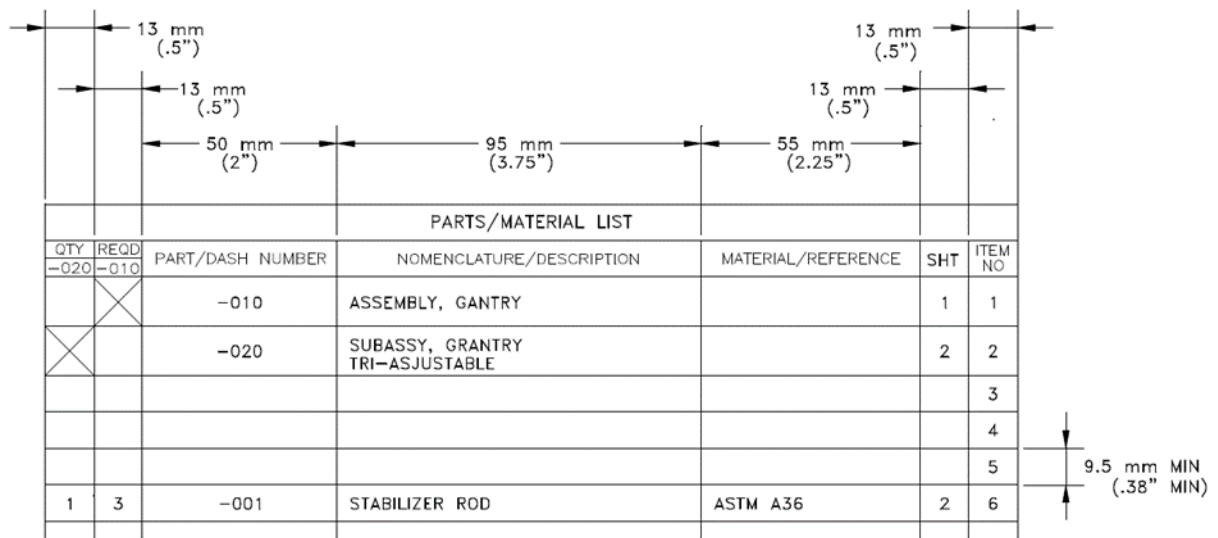
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5. Prefabricated
6. Electrical, instrumentation, and HVAC disciplines (non-project)
7. Project construction type drawings only
8. Process hood systems (supply and exhaust) and process exhaust systems drawings only

3.22.1 Arrangement and Size

The minimum width of the Parts/Material List block having one quantity column is 239 mm (9.5"). See Figure 11. Quantity columns may be added as necessary. The parts/material list shall be located, or begin, in the upper right-hand corner on the first sheet of the drawing.

Figure 11. Parts/Material List Arrangement and Size



3.22.2 Contents

The parts/material list shall contain all material and separable components on the drawing. The individual pieces of weldments or other inseparable assemblies normally are not numbered separately. See Appendix F for recommended industry practices.

3.22.3 Part Arrangement/Order

The parts/material list should be arranged in a hierarchy (i.e., assemblies, subassemblies, detail parts, catalog items). It is not necessary to rearrange the parts/material list merely to add a later entry.

3.22.4 Part Number

Unique part numbers shall be assigned where control of a design configuration (i.e., assembly, subassembly and detail) is controlled on an H series drawing. A part number

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shall be used to uniquely identify a specific item. Non-interchangeable items shall be identified with separate and unique part numbers.

The official part number is the drawing number and the assigned dash number. When a part number is referenced, both the drawing number and the dash number are required. See definition of dash number in Appendix G, Glossary

3.22.5 Parts and Assembly Numbers

Each assembly, subassembly, and detailed part is assigned a separate and unique part (dash) number. The primary assembly is assigned the -010 dash number. Additional assemblies and subassemblies are assigned every tenth number consecutively (i.e., -020, -030, -040, etc). The first detailed part is assigned the -001 dash number. Additional detailed parts are assigned -002, -003, -004, etc., with every tenth digit reserved for assemblies.

3.22.6 Interchangeable Parts

Interchangeable parts are equivalent in performance and durability. They are capable of being exchanged one for the other without alteration of the item or of adjoining items, except for nominal adjustment. They are also interchangeable in terms of fit and performance. Interchangeability is also explained in general notes with a statement in the parts/material list to see the applicable general note.

3.22.7 Part Number Revisions

The parts/materials list periodically requires revisions and/or material deletions due to fabrication changes or modifications to the original design. The following are accepted methods for changing the parts/material list, when accompanied by a change document:

- Remove a part or material item by placing a double line through the part or material item (e.g., CAD or manual drawings).
- Remove a part or material item and add the word "Deleted," in place of the part or material item (e.g., CAD revision).

3.22.8 New Part Number

New part numbers, including applicable altered item part numbers shall be assigned when the design of a part, fabricated assembly, or procured item is changed. See Section 3.22.10 and MSC-ENG-PRO-440, *MSC Engineering Package Process*. The following conditions determine if a new part number is required:

- Performance or durability is affected to the extent superseded items must be discarded for reasons of safety, failure, or malfunction.

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- Parts, assemblies, or subassemblies are changed so the new designs are not directly and completely interchangeable with respect to installation and/or specified performance.
- When replaced/redesigned parts are limited to use in specific applications and the newly designed items are not so limited.
- When an existing Hanford item, or vendors' purchased item, requires alteration.
- When existing items cannot be reworked to be directly and completely interchangeable with the new design.

NOTE: New materials shall be added at the end of the parts/materials list using sequential part numbers. Part numbers shall not be reused for new or different parts/material. New part numbers are required.

3.22.9 Purchased Items

Purchased items shall be identified in the parts/materials list with the manufacturer's part number or vendor information (VI) number as applicable. These items are normally controlled by the vendor, by industrial or government codes, standards, or file number.

3.22.10 Altered Item

If the design of a vendor-supplied item is altered after purchase for an existing Hanford Site application (documentation may be contained in a VI file), or for use in a new engineering design, the following requirements apply:

“ALTERED FROM (manufacturer's part number and part name or existing Hanford part number and part name)” is recorded in the description column of the parts list.

A new Hanford part number shall be assigned and placed in the part number column.

The alteration is detailed by visible lines (in accordance with ASME Y14.2M-1992, Line Conventions and Lettering. Reference features (features not requiring alteration) shall be limited to orientation for describing where designated alterations are required. Reference features are shown by phantom lines in accordance with ASME Y14.2M.

3.22.11 Quantities and Customary Trade Units

Quantities shall be counted accurately and shown in customary trade units.

3.22.12 As Required (AR) Designation

The letters AR (as required) shall be used where the quantity is not known or where the quantity could vary.

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3.22.13 Part Description

The part description shall be generic, except where a specific item is required, and the design depends on or is tailored to the specific item. The name of the item shall be listed first with supplemental descriptive words following. The description of an item shall be complete and provide specifications sufficient to procure the item.

Standard industry language shall be used to define the item. If the item can be completely described in the parts/materials list, it shall not be delineated on the drawing. If description/specification is lengthy, it may be in the general notes or in a separate specification. If the description/specification is placed in the general notes or in a separate specification, the general note or separate specification shall be referenced in the description column of the parts list, as required.

3.23 Metric Measurement System

3.23.1 General

Metric designations (e.g., mm) are considered symbols and shall be used to the fullest extent possible.

Where metric system (SI) symbology, as identified in the latest edition of ANSI/IEEE Standard 268, American National Standard for Metric Practice, differs from what appears in ASME Y1.1, the appropriate metric symbols shall be used.

Modifications to drawings containing English units shall continue to use the English system unless otherwise specified by the Design Authority.

3.23.2 Metric Measurement

In designs specifying metric system of measurement, hard metric measurements shall be used to the fullest extent (i.e., the inch/pound system shall not be used in the design development and then applied to the design by converting the inch/pound measurements to metric measurements, which is considered “soft metric conversion,” as compared to hard metric conversion. See definitions in Appendix G, Glossary).

3.23.3 Metric Dimensioning

Linear dimensions on engineering drawings shall be shown in millimeters, except on large site plans and civil drawings. Large site plans and civil drawings show linear dimensions in meters, which shall always be carried to one, two, or three decimal places.

Commas shall not be used in metric system numbers. Spaces are used in place of commas to separate digits into groups of three (e.g., 1 500 000 mm). However, four-digit numbers are not separated by a space (e.g., 5000 m). A space always separates the numeric value

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from the measurement unit, but the number and the unit are never separated between the lines of text.

Metric dimensions and unit symbols must always be in upright type (i.e., vertical lettering), even when the surrounding text is in italics.

When area is being specified, square meters or sub-multiples shall be used (e.g., m², cm², and mm²). Fluid volumes shall be specified in liters (symbol is upper case L), except large volumes may be expressed in cubic meters (m³) (e.g., 1000 L = 1 m³).

Dual dimensioning (both inch/pound and metric shown for the same dimension) should be avoided. In cases where dual dimensioning is determined to be required, the following shall apply:

Metric dimensions are shown first with the inch/pound equivalent shown in parentheses.

A general note shall be added to the drawing stating the inch/pound dimensions shown in parentheses are equivalent to the metric dimensions they follow.

Tolerances for the inch/pound dimension, where necessary, shall be shown at each occurrence.

3.23.4 Metric Notation

Drawings delineated in the metric system shall have the word "METRIC" placed directly above the Title Block in 6 mm bold gothic lettering as defined by ANSI Y14.2M-1992. See Figure 12 and Figure 5.

3.23.5 Third Angle Projection

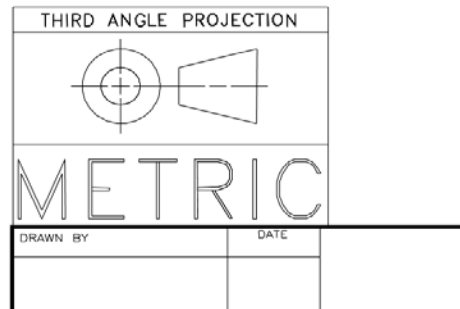
All drawings developed using the multi-view system of orthographic presentation as specified in ASME Y14.3M-1994, Multi and Sectional View Drawings, shall use the third angle projection method. On metric drawings, the international projection symbol and the words "THIRD ANGLE PROJECTION" shall be placed directly above the metric notation. See Figures 12 and 5.

Figure 12. International Projection Symbol

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3.23.6 Converted Metric Designations

Converted metric designations are designations of materials and parts converted from the inch/pound system (e.g., 2" pipe converted to DN 50 pipe; 2x4 lumber stud converted to 50 x 100 mm lumber stud). These conversions are made where items can be equivalently identified by metric designation.

Many industrial products have been given metric designations by the appropriate industry organizations. In some cases where designations will lose their proper meaning, inch or metric equivalents are never shown (e.g., 1/4-20 thread loses its proper meaning if designated as 6.35 mm-20 thread; conversely, a 6 mm-20 thread loses its proper meaning if designated as a .236-20 thread).

3.24 Revisions

Drawings previously released into the Hanford drawing system are not required to meet the format requirements of this standard, e.g., title block, revision block, parts list, of this standard.

3.24.1 Revisions Block Size and Location

REVISION blocks on new drawings shall be sized according to ANSI Y14.1, and configured as shown in Figure 13. Location of the block shall be according to the drawing arrangement format. See Figure 5.

Figure 13. Typical Revision Block

	MFD	REV NO	DESCRIPTION	REV BY DATE			ENGR COMPANY	DESIGN
	REV Rel	REVISIONS						

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3.24.2 Description

The authorizing engineering change document shall be documented in the revision description (e.g., FMP, DCN, ECR, etc.). Conservation of space is essential; therefore, ANSI abbreviations shall be used to the best advantage.

3.24.3 Revision Numbers

When revising multiple-sheet drawings, each sheet shall be considered a separate drawing. Revision numbers shall be advanced only on the sheet or sheets being affected by the change.

3.24.4 Change Incorporation - For Drawings that are Maintained in the Hanford Drawing System

The authorizing change document number shall be shown in the REVISIONS Block (e.g., REVISED PER ECR [number]).

3.24.4.1 Incorporation of Engineering Change Notices

During change document incorporation, an additional change document is not required for the following non-technical changes:

- When adding an additional sheet(s) to an affected drawing as a result of the incorporation of a change document. Under these circumstances the original change document being incorporated is the authorizing change document.
- Correcting misspelled words.
- Adding or revising related/referenced arrangements, views, sections, details, and/or tables to accurately delineate the approved change document incorporation on an affected drawing.
- Delineating the change document incorporation on a subsequent sheet(s) of an affected drawing when there is insufficient space available for depicting the required information.

A statement describing variances from the authorizing ECR shall be added in the revision description block to document the changes. Examples are as follows:

- Incorporated ECR XXXXXX, was sheet 3 of 4
- Incorporated ECR XXXXXX, moved detail X
- Incorporated ECR XXXXXX, added detail X due to insufficient space on sheet X
- Incorporated ECR XXXXXX, added new sheet X.

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3.24.4.2 Revision Numbering, Release, and Microfilming

Each new revision shall be listed in numerical sequence. Only released (issued) and microfilmed drawings shall be revised. Each subsequent revision shall be released and microfilmed before another revision is made. The latest revision number shall be shown in the Title Block. See Section 3.7.7 and Figure 13.

3.24.4.3 CAD-Revised Drawings

CAD-developed drawings do not require approval signatures from previous revisions to be printed in the spaces of the Title or REVISIONS Block. Reference to see the applicable revision is placed in the approval block (e.g., “See Revision 0”, or “See Revision 5”).

On drawings that have a CADFILE and CADCODE the data is to be removed or a strikeout through the text. See Figure 14.

Figure 14. CADCODE and CADFILE Strike out

MFD	REV NO	DESCRIPTION	REV BY DATE	ENGR	COMPANY
REV REL	REVISIONS				
CADFILE =F014982A=		CADCODE =WIN95.ACB2.14.0.SS=			
3			2		

3.24.5 Removing Revisions

Drawings in the Hanford system that have been previously approved and microfilmed may have revisions removed from the drawing(s) on subsequent revisions.

3.24.6 Revision Documentation and Approval

The Design Authority shall sign and enter their company acronym in the ENGR/COMPANY block of the revision block. See Figures 13 and 14. Drawing revision requirements and results shall be documented and approved by an change document prior to the release of a drawing that has been revised.

3.24.7 Change After Approval

Changes made to drawings (after approval and before formal release and microfilming) shall require complete re-approval of the drawings. All existing approval signatures and dates shall be removed and new approval signatures shall be obtained.

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3.24.8 Adding Additional Sheets

Additional sheet(s) shall be released as revision "0." The change document number being incorporated shall be placed in the block identified for the Engineering Data Transmittal (EDT). The letters EDT shall be removed or marked out and the number placed in this block (e.g., change document [number]).

3.25 Classified and Sensitive Drawings

When classified or sensitive information is to appear on any drawing, an Authorized Derivative Classifier (ADC) shall review and determine the security classification level (Top Secret, Secret, or Confidential) and the category (Restricted Data, Formerly Restricted Data, National Security Information) or other control designation (e.g., Unclassified Controlled Nuclear Information, Export Control Information) for the drawings.

The originating organization shall:

- mark the drawing to reflect the security classification level and category or other required controls;
- contact the Classified Document Control organization to establish accountability as required;
- protect the document using security and handling requirements.

Classified drawings are released through Hanford Classified Document Control. Refer all questions regarding classifications to the Classified Matter Protection and Control Program office.

3.26 Superseded Drawings, Voided Drawings, and Title Block Changes

When drawings are superseded or voided, or when a building, index, or drawing number is changed, the affected drawings shall be revised with an change document.

3.26.1 Superseding a Drawing with a Different Drawing Number**3.26.1.1 The Superseded Drawing**

A note stating, "SUPERSEDED BY DWG [number] REV.[number]," shall be placed near the Title Block in 6 mm (.24") high lettering.

3.26.1.2 The New Drawing

A note stating, "SUPERSEDES DWG [number] REV. [number]," shall be placed near the Title Block in 6 mm (.24") high lettering.

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3.26.2 Superseding an Approved Drawing with a Drawing of the Same Drawing Number (Redraw)

NOTE: Revision of a CAD .DWG file is not a redraw. Development of a new CAD .DWG file from an existing released drawing is a redraw and the following requirements apply.

3.26.2.1 New Revised Drawing

The authorizing change document number shall be shown in the REVISIONS Block (e.g., REVISED PER change document [number]).

The original drawing number is used. All original signatures and dates are printed in the Title Block or a reference is added referring to previous drawing revisions for original signatures.

All previous revisions shall be deleted. The revision shall state the reason for the redraw (e.g., REDRAWN, GENERAL CHANGE OF DELINEATION, or REDRAWN DUE TO CONDITION OF ORIGINAL).

3.26.2.2 Old Drawing

The old manual drawing is to accompany the new drawing when returned to vault.

A note stating, "SUPERSEDED BY DRAWING OF THE SAME NUMBER REV [number]," shall be placed near the Title Block in 6 mm (.24") high lettering.

3.26.3 Voided Drawings

The word "VOID" shall be placed near the Title Block in 12 mm (.5") high lettering. All outstanding change document's against the voided drawing are to be listed under the word "VOID". The revision of the drawing is advanced with the authorizing change document number identified in the REVISIONS Block (e.g., VOID PER ECR [number]).

The use of a microfilm copy of the affected drawing may be used in place of the original drawing for this voiding process.

3.26.4 Changing Drawing Numbers, Index Numbers, or Building Numbers**3.26.4.1 Changing Index Numbers**

Add or delete additional Index Numbers by revision of the drawing.

3.26.4.2 Changing Building Numbers

Add or delete Building Numbers by revision of the drawing.

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3.27 Changing the Title of a Drawing

Changes in the title of an approved drawing require a revision. All current requirements apply to revised drawing titles. See Section 3.7.3.

4.0 RECORD IDENTIFICATION**5.0 SOURCES****5.1 Source Requirements**

ASME Y14.1M-1992, Metric Drawing Sheet Size and Format

ASME Y14.2M-1992, Line Conventions and Lettering

ASME Y14.3M-1994, Multi and Sectional View Drawings Data Value Standard

ANSI/IEEE Standard 268, American National Standard for Metric Practice

ANSI/ASME Y14 Series, Drafting Practices

ANSI Y1.1 (latest edition), Abbreviations for Use on Drawings and in Text

ANSI Y14.1-1980 (R1987), Drawing Sheet Size and Format

ANSI Y14.5M (R1982), Dimensioning and Tolerance

Data Value Standard, Protocol Standard, Geodetic Elevation Data

Federal Standard 376B, Preferred Metric Units for General Use by the Federal Government

5.2 References

MSC-PRO-ENG-709, CAD and Drawing Development and Control Process for Engineering Drawings

HNF-14660, Off-Site Subcontractor Direction for Preparation and Control of Engineering Drawings

HNF-64101, Preparation Standards for Engineering Drawings,

HNF-64103, Preparation of Process Flow Diagrams and Piping and Instrumentation Diagram

HNF-22999, CAD Data File Standards for Engineering Drawings

HNF-23000, Preparation Standard for Engineering Drawings

HNF-23001, Index Number Standard for Engineering Drawings

MSC-PRO-ENG-16406, Vendor Information Process

MSC-PRO-RM-10588, Records Management Processes

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MSC-PRO-2001, Facility Modification Package Process

MSC-PRO-RM-32281, Electronic Records Management

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6.0 APPENDICES**Appendix A. Guide to Historical Drawing Numbers****Appendix B. Startup Layer Naming Standard****Appendix C. Index Number System for Engineering Drawings, Alphabetic Listing****Appendix D. Index Number System for Engineering Drawings, Numeric Listing****Appendix E. Hanford Drawing Symbolology Standards****Appendix F. Parts/Materials List****Appendix G. Glossary**

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Appendix A. Guide to Historical Drawing Numbers

The Hanford drawing system has a legacy of drawings that do not conform to current practices. This guide will assist in interpreting the drawing numbering system from the early days of Hanford and from irregularities in the drawing tracking system

The following designations are a legacy of Hanford's early days.

- AEC - Used for 700 and 1100 Areas (Atomic Energy Commission drawing file)
- SP and P - Used for 100 H and 100 C Areas
- M-Series - Used for Hanford area maps
- D and W - Used for original DuPont drawings (W = Arrangements/Profiles; D = Details)
- SK-Series - Assigned to temporary drawings for off-site procurement, experimental equipment, limited-use test equipment and conceptual designs.
- The 400 Area, FFTF facility, has a number of Architectural/Engineering (AE) drawings that have various drawing number assignments. These drawings are maintained as a special case in the Hanford drawing system. Some examples of the drawing numbers are: 00369, 30703726-000, 375, 6083-01-301, 671C499, 6MD13007-2D1, A888-6001, AA-4698, P-C418, SKT-241, T73065-300, W-22027-17-20, W-26007, S-06-07-1.

NOTE: Drawing prefixes AEC, SP, P, M, D, W, and SK are record drawings only; all new drawings shall use an "H" prefix.

Drawing number irregularities include the following:

- Certain 202-A building drawing numbers (200 Area) - Example: H-2-53505-M. Disregard the letter designator "M" in this example. These letters are to be removed as part of the next regular revision. New drawings calling out these drawings as a reference will omit the letter designator.
- Certain 222-S, 284-E, and 284-W building drawing numbers (200 Area)
- Example: H-II-4428-10. The "H-II" was intended to be Roman numeral II, and may be confused with "H-11" (1100 Area drawings). The "-10" suffix is the sheet number. All references to these drawings on new drawings should be, for example, "H-II-4428 sheet 10." Revisions to these drawings do not require that the Roman numerals be changed to Arabic. New drawings developed for these buildings shall use "H-2" prefixes and conventional sheet identification.
- Certain "H-4" drawings and some early instrument drawings using "H-4" drawing numbers were used for sitewide applications.

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Appendix B. Startup Layer Naming Standard

Table 1, General Layering for All Disciplines

Table 2, Architectural Drawings

Table 3, Civil/Structural/Environmental Drawings

Table 4, Electrical Drawings

Table 5, Fire Protection Drawings

Table 6, HVAC Drawings

Table 7, Instrumentation & Control (I&C) Drawings

Table 8, Mechanical Drawings

Table 9, Piping Drawings

Appendix B – Table 1

Table 1
Startup Layer Naming Standard
General Layering For All Disciplines

NOTE: Selected layers from the general layering for all disciplines are added to the drawing setup models as determined appropriate and necessary to define and separate drawing data.

LAYER NAME	DESCRIPTION	LINE COLOR	LINETYPE	PLOTTER PEN NUMBER
AUTOCAD PROGRAM				
0	AutoCAD generated. Not for project drawings; used for standard symbol creation	White	Continuous	Pen No. 2
DEFPOINTS	AutoCAD generated; associative dimensioning's definition points automatically on this layer; used for display, only, as AutoCAD will not print.	White	Continuous	Pen No. 2
GENERAL LAYERS				
*?O-BRD	Title block, associated blocks, and drawing border	132	Continuous	Pen No. 2
*?M-DIM	Dimensioning	253	Continuous	Pen No. 1
*?T-TXT	General text not associated with a specific layer	White	Continuous	Pen No. 2
*?T-BTXT	Bold text	Yellow	Continuous	Pen No. 4
*?T-REF	Reference items and notes that aid CAD uses during construction of the drawing	213	Continuous	Pen No. 1
*?T-CHK	Checker's marks (informal only)	11	Continuous	Pen No. 3
*?O-VPT	Paper space Viewport border	White	Continuous	Pen No. 2
*?O-CLD	Clouded areas for Hold, ECN, and revision	White	Continuous	Pen No. 2
*?E-EXST	Anything existing to remain	8	Phantom	Pen No. 1
*?D-DEMO	Existing items /equipment required to be removed or demolished	Cyan	HiddenX2	Pen No. 3
*?C-CLINE	Center line	Blue	Center	Pen No. 2
*?X-HATCH	Cross-section lines	Blue	Continuous	Pen No. 2
*?H-HIDL	Hidden lines	Blue	Hidden	Pen No. 2
*?V-MLN	Matchlines	Red	Phantom	Pen No. 5

* The "?" in the layer name is replaced with the correct Discipline Identifier. See section 2.3.1.c.

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Appendix B – Table 2

Table 2
Startup Layer Naming Standard
Architectural Drawings

NOTE: When additional layers are created to specify discipline information, other than architectural, the object/function identifier from the appropriate discipline table should be used to define the drawing data. As appropriate, the architectural discipline identifier should be used and the applicable plotter pen number assigned.

LAYER NAME	DESCRIPTION	LINE COLOR	LINETYPE	PLOTTER PEN NUMBER
GENERAL LAYERS				
AO-BRD	Title block, associated blocks, and drawing border	132	Continuous	Pen No. 2
AM-DIM	Dimensioning	253	Continuous	Pen No. 1
AT-TXT	General text not associated with a specific layer	White	Continuous	Pen No. 2
AT-BTXT	Bold text	Yellow	Continuous	Pen No. 4
AT-REF	Reference items and notes that aid CAD users during construction of the drawing	213	Continuous	Pen No. 1
AO-VPT	Paper space Viewport border	White	Continuous	Pen No. 2
AO-CLD	Clouded areas for Hold, ECN, and revision	White	Continuous	Pen No. 2
AE-EXST	Anything existing to remain	8	Phantom	Pen No. 1
AD-DEMO	Existing items /equipment required to be removed or demolished	Cyan	HiddenX2	Pen No. 3
AX-HATCH	Cross-section lines	Blue	Continuous	Pen No. 2
AV-MLN	Matchlines	Red	Phantom	Pen No. 5
SPECIFIC LAYERS				
AO-ACCESSORY	Accessory items - including furniture, HVAC equipment, plumbing fixtures, people, trees, vehicles, etc.	White	Continuous	Pen No. 2
AO-CEILING	Ceiling - SATC, hanger wires, etc.	White	Continuous	Pen No. 2
AC-COLUMN	Building column lines	White	Center	Pen No. 2
AO-DOOR	Interior and exterior	Magenta	Continuous	Pen No. 2
AO-DOORSPEC	Door tag (Architectural Steering Group users only)	White	Continuous	Pen No. 2
AO-FLOOR	Floor plan and background	8	Continuous	Pen No. 2
AO-HEADER	Door header (use with ceiling plan)	White	Continuous	Pen No. 2
AO-SCHEDULE	Room, door, finish, and window	Cyan	Continuous	Pen No. 3
AO-STAIR	Interior and exterior	White	Continuous	Pen No. 2
AO-TAG	Tags for miscellaneous equipment, windows, etc.	White	Continuous	Pen No. 2
AO-WALLS	Interior and exterior	Cyan	Continuous	Pen No. 3
AO-WINDOWS	Interior and exterior	White	Continuous	Pen No. 2

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Appendix B – Table 3

Table 3
Startup Layer Naming Standard
Civil/Structural/Environmental Drawings

NOTE: When civil and structural items exist in the same drawing, use both layer naming standards as applicable.

LAYER NAME	DESCRIPTION	LINE COLOR	LINETYPE	PLOTTER PEN NUMBER
GENERAL LAYERS				
*?O-BRD	Title block, associated blocks, and drawing border	132	Continuous	Pen No. 2
*?T-TXT	General text not associated with a specific layer	White	Continuous	Pen No. 2
*?T-REF	Reference items and notes that aid CAD users during construction of the drawing	213	Continuous	Pen No. 1
*?O-VPT	Paper space Viewport border	White	Continuous	Pen No. 2
*?V-MLN	Matchlines	Red	Phantom	Pen No. 5
* Specified general layers are used in both the civil and structural drawings. The "?" is replaced with the correct Discipline Identifier; see Section 2.3.1.c.				
CIVIL DRAWING SPECIFIC LAYERS				
CO-GRID	Site Grids, Profile Grids, etc.	253	Continuous	Pen No. 1
CO-SITE	Property lines, boundaries, fences, etc.	60	Continuous	Pen No. 4
CO-ROAD	Roads, trails, parking, etc.	10	Continuous	Pen No. 4
CO-STRL	Structural work	210	Continuous	Pen No. 4
CO-GND	Contours, grade breaks, etc.	Green	Continuous	Pen No. 4
CO-PIPE	Pipelines and piping	Yellow	Continuous	Pen No. 4
STRUCTURAL DRAWING SPECIFIC LAYERS				
SC-GRID	Building column grid	253	Center	Pen No. 1
SO-GND	Grade or earth shown on sections	Green	Continuous	Pen No. 4
SO-CONC	Concrete	Yellow	Continuous	Pen No. 4
SO-FRWK	Framework	Cyan	Continuous	Pen No. 3
SO-RBR	Rebar	130	Continuous	Pen No. 4
SO-MECH	Piping or other mechanical	11	Continuous	Pen No. 3
SO-EMBED	Embedments	131	Continuous	Pen No. 3
SO-STL	Steel	130	Continuous	Pen No. 4

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Appendix B – Table 4

Table 4
Startup Layer Naming Standard
Electrical Drawings

LAYER NAME	DESCRIPTION	LINE COLOR	LINETYPE	PLOTTER PEN NUMBER
GENERAL LAYERS				
*EO-BRD	Title block, associated blocks, and drawing border	132	Continuous	Pen No. 2
EM-DIM	Dimensioning	253	Continuous	Pen No. 1
ET-TXT	General text not associated with a specific layer	White	Continuous	Pen No. 2
ET-BTXT	Bold text	Yellow	Continuous	Pen No. 4
* Specified general layers are used in both the LGT/SITE and DIAG/SCHED drawings.				
LIGHTING/SITE DRAWING SPECIFIC LAYERS				
EE-BKG	Background	8	Phantom2	Pen No. 1
EO-BLD	Building	171	Continuous	Pen No. 3
EO-CND	Conduit, cable, raceway, boxes, ductbanks	51	Continuous	Pen No. 3
EO-CPT	Cathodic protection	11	Continuous	Pen No. 3
EO-EQP	Equipment	211	Continuous	Pen No. 3
EO-LTG	Lighting	Cyan	Continuous	Pen No. 3
EO-MS1	Electric miscellaneous 1	32	Continuous	Pen No. 2
EO-MS2	Electric miscellaneous 2	51	Continuous	Pen No. 3
EO-OHD	Overhead lines	11	Continuous	Pen No. 3
EO-RCP	Receptacles, (120, 208, 480V)	Cyan	Continuous	Pen No. 3
EO-SGD	Signaling devices	211	Continuous	Pen No. 3
EO-UGD	Underground lines (hidden)	13	Hidden	Pen No. 1
DIAGRAM/SCHEDULE DRAWING SPECIFIC LAYERS				
EO-DIA	Diagrams, one-line, elementary, etc.	91	Continuous	Pen No. 3
EO-MS1	Electric miscellaneous 1	32	Continuous	Pen No. 2
EO-MS2	Electric miscellaneous 2	51	Continuous	Pen No. 3

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Appendix B – Table 5

Table 5
Startup Layer Naming Standard
Fire Protection Drawings

LAYER NAME	DESCRIPTION	LINE COLOR	LINETYPE	PLOTTER PEN NUMBER
*GENERAL LAYERS				
FO-BRD	Title block, associated blocks, and drawing border	132	Continuous	Pen No. 2
*FM-DIM	Dimensioning	253	Continuous	Pen No. 1
FT-TXT	General text not associated with a specific layer	White	Continuous	Pen No. 2
FT-BTXT	Bold text	Yellow	Continuous	Pen No. 4
FE-EXST	Anything existing to remain	8	Phantom	Pen No. 1
FD-DEMO	Existing items /equipment required to be removed or demolished	Cyan	HiddenX2	Pen No. 3
**FC-CLINE	Center line	Blue	Center	Pen No. 2
FV-MLN	Matchlines	Red	Phantom	Pen No. 5
FIRE DETECTION DRAWING SPECIFIC LAYERS				
FO-AD	Alarm and detection system	211	Continuous	Pen No. 3
FO-FW	Fire water underground	211	Hidden	Pen No. 3
SPRINKLER DRAWING SPECIFIC LAYERS				
FO-FW	Fire water underground	211	Hidden	Pen No. 3
FO-SS	Sprinkler system	211	Continuous	Pen No. 3
FO-HS-1	Standpipe hose system	211	Continuous	Pen No. 3

* Specified general layers are used in both the fire detection and sprinkler drawings, except as noted.

** Sprinkler drawing only.

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Appendix B – Table 6

Table 6
Startup Layer Naming Standard
HVAC Drawings

LAYER NAME	DESCRIPTION	LINE COLOR	LINETYPE	PLOTTER PEN NUMBER
*GENERAL LAYERS				
HO-BRD	Title block, associated blocks, and drawing border	132	Continuous	Pen No. 2
HM-DIM	Dimensioning	253	Continuous	Pen No. 1
HT-TXT	General text not associated with a specific layer	White	Continuous	Pen No. 2
HT-BTXT	Bold text	Yellow	Continuous	Pen No. 4
*HT-REF	Reference items and notes that aid CAD users during construction of the drawing	213	Continuous	Pen No. 1
**HO-VPT	Paper space Viewport border	White	Continuous	Pen No. 2
HV-MLN	Matchlines	Red	Phantom	Pen No. 5
* Specified general layers are used in both the HVAC and HVAC/Instrumentation Drawings, except as noted.				
** HVAC drawing only.				
HVAC DRAWING SPECIFIC LAYERS				
HO-EQP	HVAC or piping equipment	51	Continuous	Pen No. 3
HO-EXH	HVAC exhaust system	171	Continuous	Pen No. 3
HO-PIP	Piping and piping fixtures and hardware	51	Continuous	Pen No. 3
HO-PLM	Plumbing and plumbing fixtures and hardware	201	Continuous	Pen No. 3
HO-RTN	HVAC return system	Cyan	Continuous	Pen No. 3
HO-SUP	HVAC supply system	51	Continuous	Pen No. 3
HVAC/INSTRUMENTATION DRAWING SPECIFIC LAYERS				
IO-ELEC	Electrical equipment	71	Continuous	Pen No. 3
IO-DCS	Distributed control system instruments	Cyan	Continuous	Pen No. 3
IO-ELINE	Electrical signal lines	42	Hidden	Pen No. 2
IO-ILINE	Instrument lines, such as pneumatic	Magenta	Continuous	Pen No. 2
IO-CVAL	Control valves	Cyan	Continuous	Pen No. 3
IO-SLINE	Software link line	Magenta	Continuous	Pen No. 3

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Appendix B – Table 7

Table 7
Startup Layer Naming Standard
Instrumentation & Control (I&C) Drawings

NOTE: When creating additional layers to specify existing and future layers, the preferred color is 8, which is designated to Plotter Pen No. 1.

LAYER NAME	DESCRIPTION	LINE COLOR	LINETYPE	PLOTTER PEN NUMBER
*GENERAL LAYERS				
IO-BRD	Title block, associated blocks, and drawing border	132	Continuous	Pen No. 2
**IM-DIM	Dimensioning	253	Continuous	Pen No. 1
IT-TXT	General text not associated with a specific layer	White	Continuous	Pen No. 2
IT-BTXT	Bold text	Yellow	Continuous	Pen No. 4
IT-REF	Reference items and notes that aid CAD users during construction of the drawing	213	Continuous	Pen No. 1
IT-CHK	Checker's marks (informal only)	11	Continuous	Pen No. 3
IO-VPT	Paper space Viewport border	White	Continuous	Pen No. 2
IO-CLD	Clouded areas for Hold, ECN, and revision	White	Continuous	Pen No. 2
IE-EXST	Anything existing to remain	8	Phantom	Pen No. 1
ID-DEMO	Existing items /equipment required to be removed or demolished	Cyan	HiddenX2	Pen No. 3
IC-CLNE	Center line	Blue	Center	Pen No. 2
IX-HATCH	Cross section lines	Blue	Continuous	Pen No. 2
IH-HIDL	Hidden lines	Blue	Hidden	Pen No. 2
IV-MLN	Matchlines	Red	Phantom	Pen No. 5
* Applicable to all instrumentation and control drawings, except as noted.				
** Plans, Elevations, Details, and Assembly drawing only.				
P&ID DRAWING SPECIFIC LAYERS				
IO-ELEC	Electrical equipment	71	Continuous	Pen No. 3
IO-INS	Instruments	211	Continuous	Pen No. 3
IO-DCS	Distributed control system instruments	Cyan	Continuous	Pen No. 3
IO-ELINE	Electrical signal lines	42	Hidden	Pen No. 2
IO-ILINE	Instrument lines, such as pneumatic	Magenta	Continuous	Pen No. 2
IO-CVAL	Control valves	Cyan	Continuous	Pen No. 3
IO-SLINE	Software link line	Magenta	Continuous	Pen No. 3
IO-EQP	Equipment	141	Continuous	Pen No. 3
IO-MAJ	Major process lines	Red	Continuous	Pen No. 5
IO-MIN	Minor process lines	Yellow	Continuous	Pen No. 4
IO-PROC	Process line	152	Continuous	Pen No. 2
IO-PIP	Piping valves and fittings	121	Continuous	Pen No. 3
PLANS, ELEVATIONS, DETAILS, AND ASSEMBLY DRAWING SPECIFIC LAYERS				
IO-TUBE	Tubing	92	Continuous	Pen No. 2
IO-BGND	Background	8	Continuous	Pen No. 1
IO-PIPE	Piping	12	Continuous	Pen No. 2
IO-BLDG	Building	8	Continuous	Pen No. 1
IO-EQP	Equipment	143	Continuous	Pen No. 1
IO-INS	Instruments	210	Continuous	Pen No. 4
IO-FRM	Panels, racks, cabinets	32	Continuous	Pen No. 2
IO-WRG	Wiring	92	Continuous	Pen No. 2
IO-CVAL	Control valve	130	Continuous	Pen No. 4
WIRING/TUBING DIAGRAM DRAWING SPECIFIC LAYERS				
IO-WRG	Wiring	Green	Continuous	Pen No. 4
IO-INS	Instruments	Magenta	Continuous	Pen No. 2
IO-DCS	Distributed control system instruments	132	Continuous	Pen No. 2
IO-TBLK	Terminal blocks	152	Continuous	Pen No. 2
IO-SLINE	Software lines	12	Continuous	Pen No. 2
IO-TUBE	Tubing	Yellow	Continuous	Pen No. 4
LOGIC/BLOCK DIAGRAM DRAWING SPECIFIC LAYERS				
IO-GATE	Logic gate/memory latch	Green	Continuous	Pen No. 4
IO-SPATH	Software signal path	12	Continuous	Pen No. 2
IO-HPATH	Hardware signal path	152	Continuous	Pen No. 2
IO-INS	Instruments	211	Continuous	Pen No. 3
IO-DCS	Distributed control system instruments	Cyan	Continuous	Pen No. 3

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Appendix B – Table 8

Table 8
Startup Layer Naming Standard
Mechanical Drawings

LAYER NAME	DESCRIPTION	LINE COLOR	LINE TYPE	PLOTTER PEN NUMBER
GENERAL LAYERS				
MO-BRD	Title block, associated blocks, and drawing border	132	Continuous	Pen No. 2
MM-DIM	Dimensioning	253	Continuous	Pen No. 1
MT-TXT	General text not associated with a specific layer	White	Continuous	Pen No. 2
MT-BTXT	Bold text	Yellow	Continuous	Pen No. 4
MT-CHK	Checker's marks (informal only)	11	Continuous	Pen No. 3
MO-VPT	Paper space Viewport border	White	Continuous	Pen No. 2
MC-CLINE	Center line	Blue	Center	Pen No. 2
MX-HATCH	Cross-section lines	Blue	Continuous	Pen No. 2
MH-HIDL	Hidden lines	Blue	Hidden	Pen No. 2
MV-MLN	Matchlines	Red	Phantom	Pen No. 5
SPECIFIC LAYERS				
*MO-1DET	Detail	Yellow	Continuous	Pen No. 4
MO-2DET	Detail	Green	Continuous	Pen No. 4
MO-FAST	Fasteners	Cyan	Continuous	Pen No. 3
MO-VEND	Vendor information	8	Continuous	Pen No. 1
MP-PHANT	Moving parts, alternate positions, simplified drafting techniques, e.g., screw threads, springs	8	Phantom	Pen No. 1
MO-LAYOUT	Layout and/or construction lines	Magenta	Continuous	Pen No. 2

* Add auxiliary details as needed. Example: 3DET, etc.

Appendix B – Table 9

Table 9
Startup Layer Naming Standard
Piping Drawings

LAYER NAME	DESCRIPTION	LINE COLOR	LINE TYPE	PLOTTER PEN NUMBER
PIPING DRAWING, JUMPER ASSEMBLY 1 DRAWING, JUMPER ASSEMBLY 2 DRAWING, and JUMPER ASSEMBLY 3 DRAWING GENERAL LAYERS				
PO-BRD	Title block, associated blocks, and drawing border	132	Continuous	Pen No. 2
PM-DIM	Dimensioning	253	Continuous	Pen No. 1
PT-TXT	General text not associated with a specific layer	White	Continuous	Pen No. 2
PT-BTXT	Bold text	Yellow	Continuous	Pen No. 4
PT-REF	Reference items and notes that aid CAD users during construction of the drawing	213	Continuous	Pen No. 1
PO-VPT	Paper space Viewport border	White	Continuous	Pen No. 2
PO-CLD	Clouded areas for Hold, ECN, and revision	White	Continuous	Pen No. 2
PE-EXST	Anything existing to remain	8	Phantom	Pen No. 1
PD-DEMO	Existing items /equipment required to be removed or demolished	Cyan	HiddenX2	Pen No. 3
PC-CLINE	Center line	Blue	Center	Pen No. 2
PX-HATCH	Cross-section lines	Blue	Continuous	Pen No. 2
PH-HIDL	Hidden lines	Blue	Hidden	Pen No. 2
PV-MLN	Matchlines	Red	Phantom	Pen No. 5
SPECIFIC LAYERS				
PO-PIPING	Single-line pipe, valves and fittings	Yellow	Continuous	Pen No. 4
PO-PIPINGD	Double-line pipe, valves and fitting	52	Continuous	Pen No. 2
PO-EQP	Pumps, vessels, etc.	Magenta	Continuous	Pen No. 2
PO-GND	Grade	8	Continuous	Pen No. 1
PO-CONC	Concrete	8	Continuous	Pen No. 1
PO-STRUCT	New structures	8	Continuous	Pen No. 1
PO-PSUPT	Supports	White	Continuous	Pen No. 2

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Appendix C. Index Number System For Engineering Drawings, Alphabetic Listing

Appendix D. Index Number System for Engineering Drawings, Numeric Listing

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Appendix E. Hanford Drawing Symbology Standards**Table 1, General Symbology Naming Standards****Table 2, Civil Symbology Naming Standards****Table 3, Structural Symbology Naming Standards****Table 4, Architectural Symbology Naming Standards****Table 5, Mechanical/machine Symbology Naming Standards****Table 6, HVAC Symbology Naming Standards****Table 7, Fire Protection Symbology Naming Standards****Table 8, Control Systems Symbology Naming Standards****Table 9, Electrical Symbology Naming Standards****Table 10-A Piping – P&ID Symbology Naming Standard****Table 10-B Piping – Fittings Symbology Naming Standards****Table 10-C Piping – Valves Symbology Naming Standards****Table 10-D Piping – Jumper Components Symbology Naming Standards****Table 10-E Piping – Jumper Details and Notes Symbology Naming Standards**

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Appendix E – Table 1

Table 1

General Symbology Naming Standards							
Legend		Example: SGGA001H					
		S	G	G	A	001	H
FILE TYPE: S = Designates Symbol File							
DISCIPLINE: G = General							
CLASSIFICATION: G = Graphics M = Miscellaneous S = Schedules							
TYPE: A = Arrows D = Drawing Status M = Miscellaneous S = Scales T = Drawing Titles							
NUMERIC SERIES: (001 - 999)							
STANDARD: S = National Standard H = Hanford							

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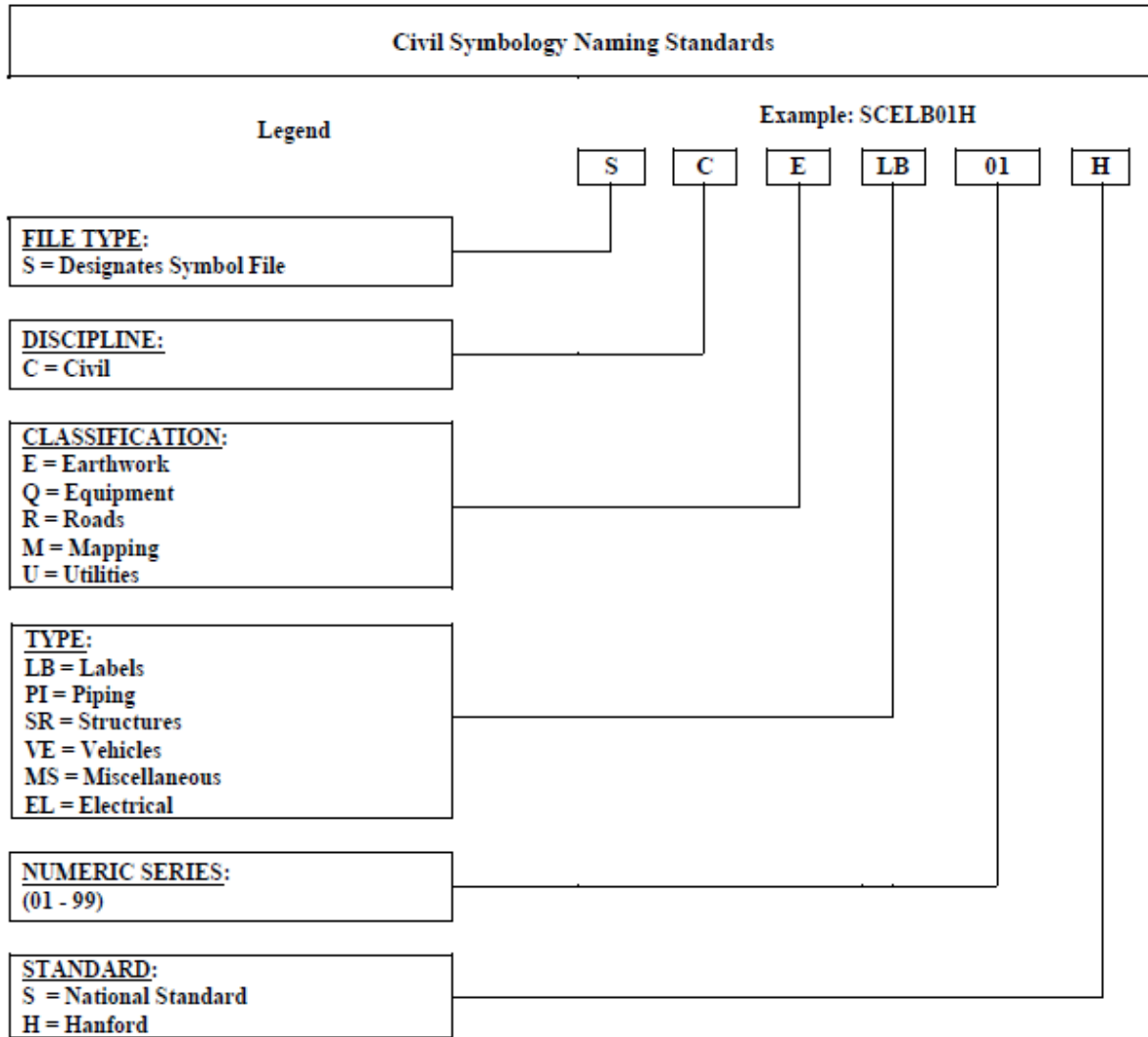
Preparation and CAD Data File Standards for Legacy Engineering Drawings

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Appendix E – Table 2

Table 2

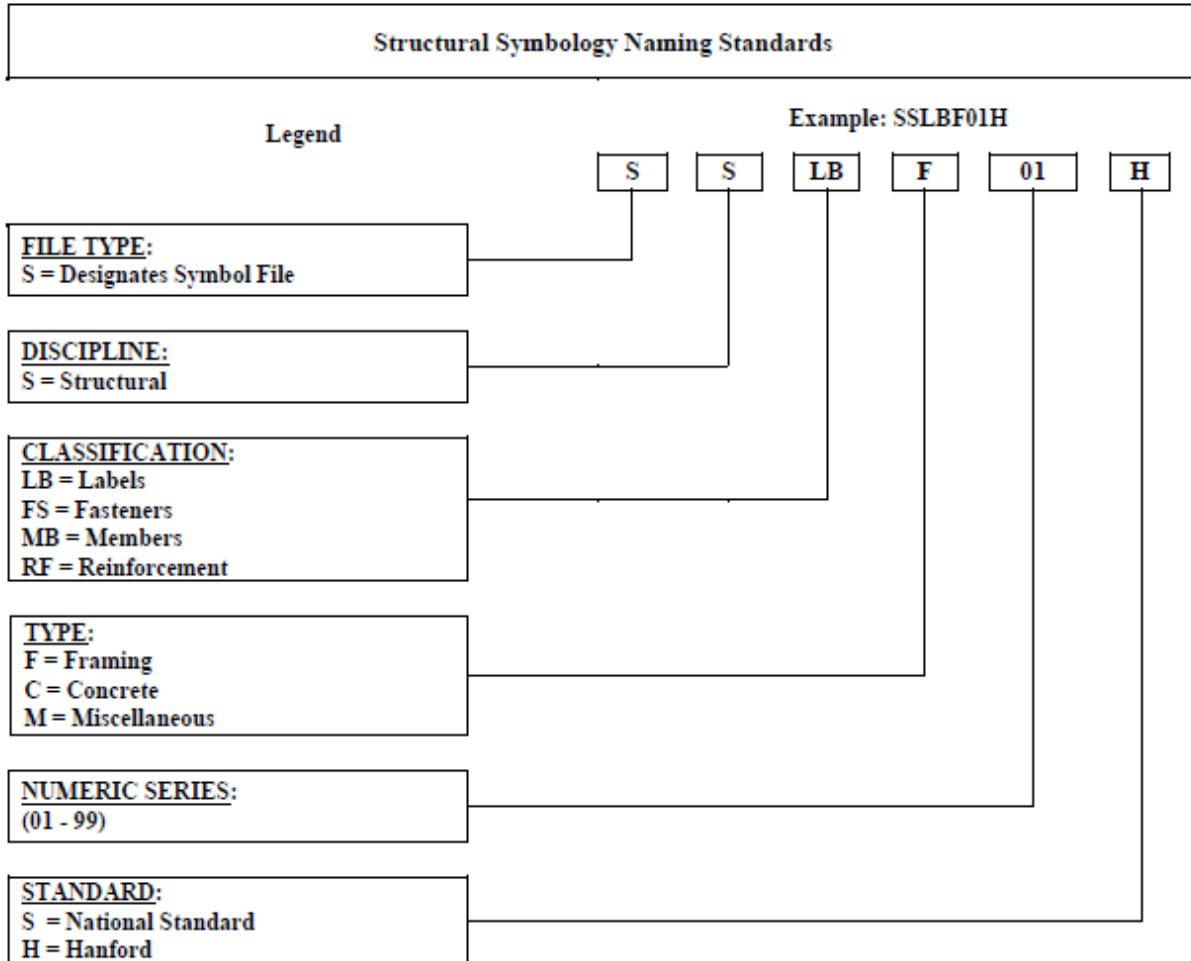


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Appendix E – Table 3**Table 3**

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Appendix E – Table 4

Table 4

Architectural Symbology Naming Standards					
Legend			Example: SAFX01PH		
	S	A	FX	01	P
FILE TYPE: S = Designates Symbol File					
DISCIPLINE: A = Architectural					
CLASSIFICATION: FX = Fixtures VE = Vehicles FR = Furniture TR = Trees PL = People MS = Miscellaneous					
NUMERIC SERIES: (01 - 99)					
VIEW: (Optional) P = Plan F = Front R = Rear S = Side					
STANDARD: S = National Standard H = Hanford					

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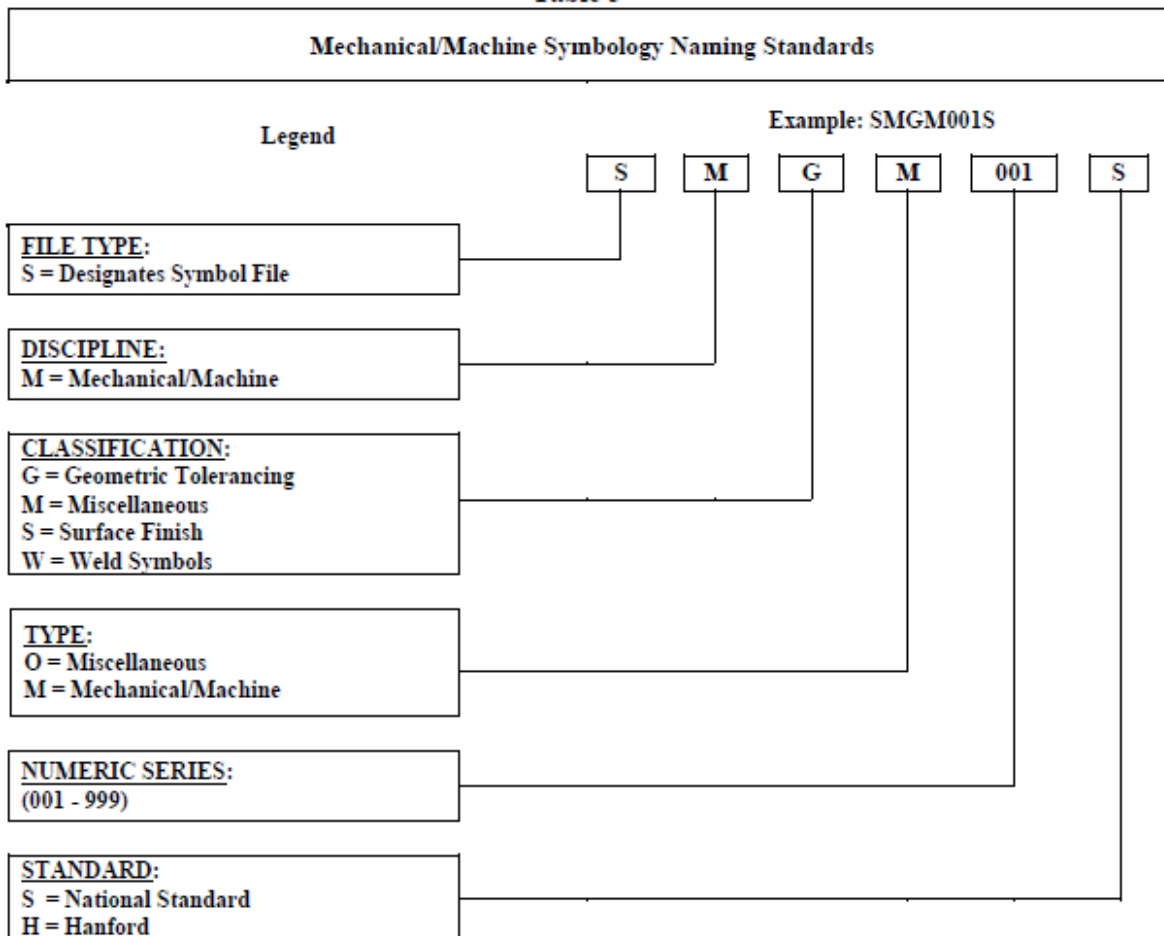
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Appendix E – Table 5

Table 5



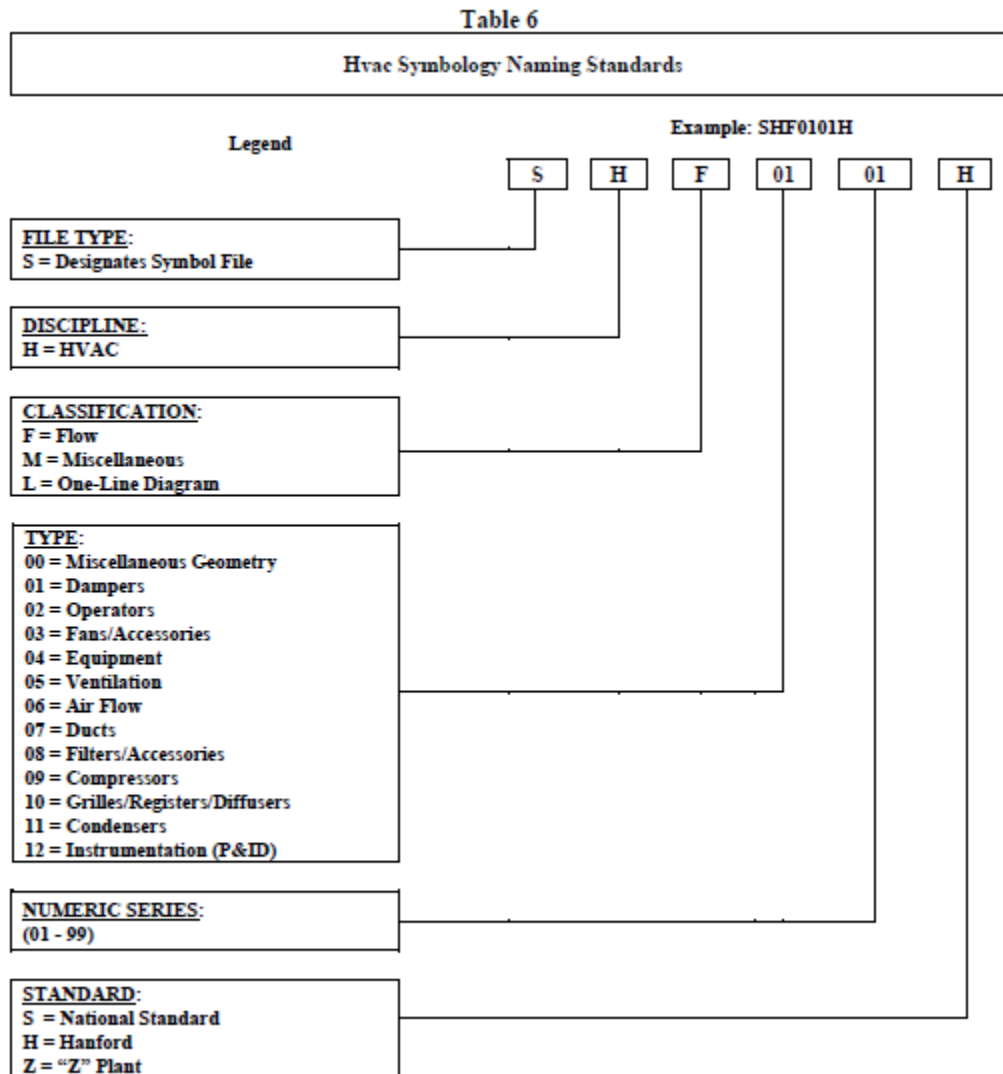
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Appendix E – Table 6



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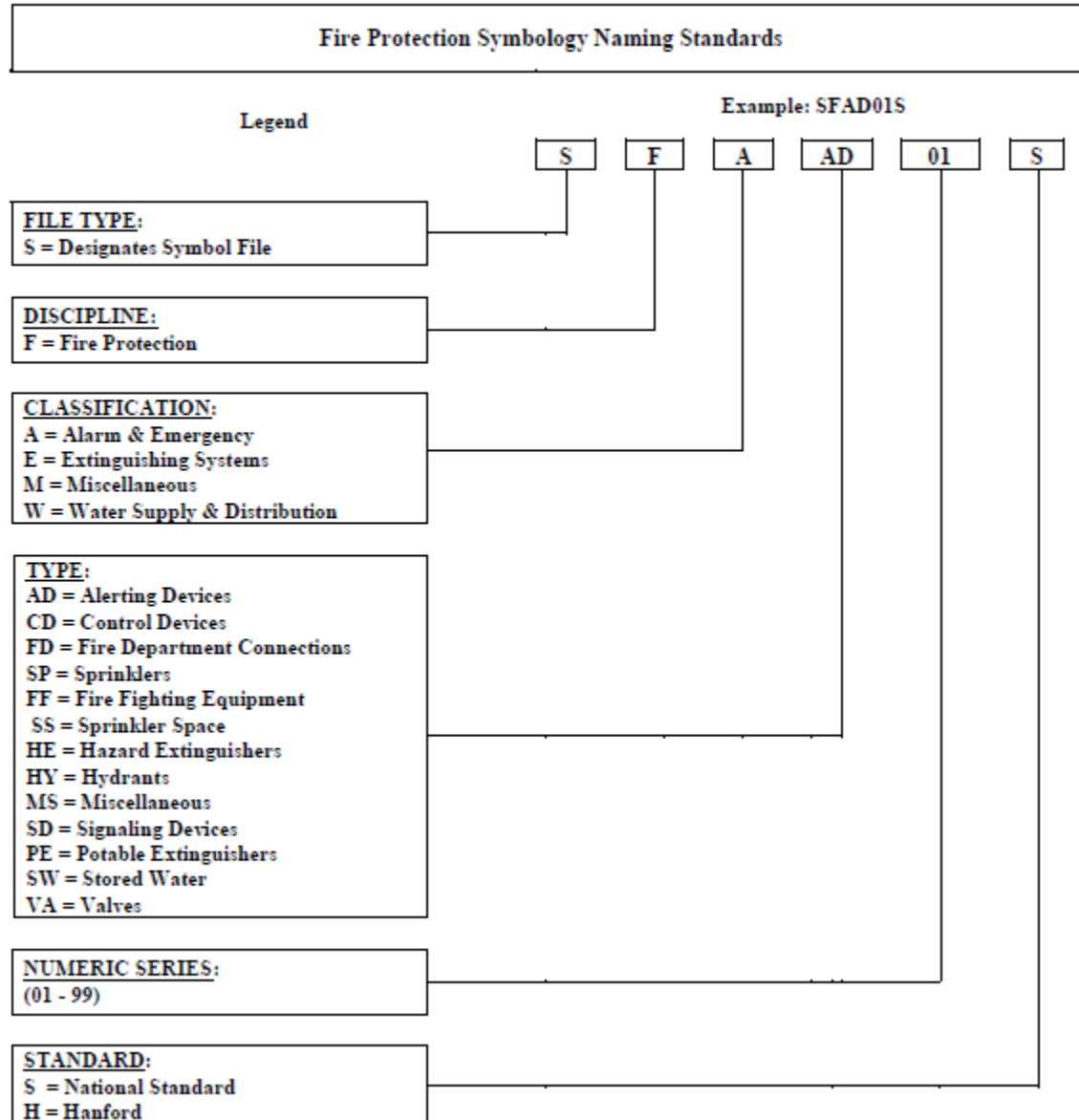
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Appendix E – Table 7

Table 7



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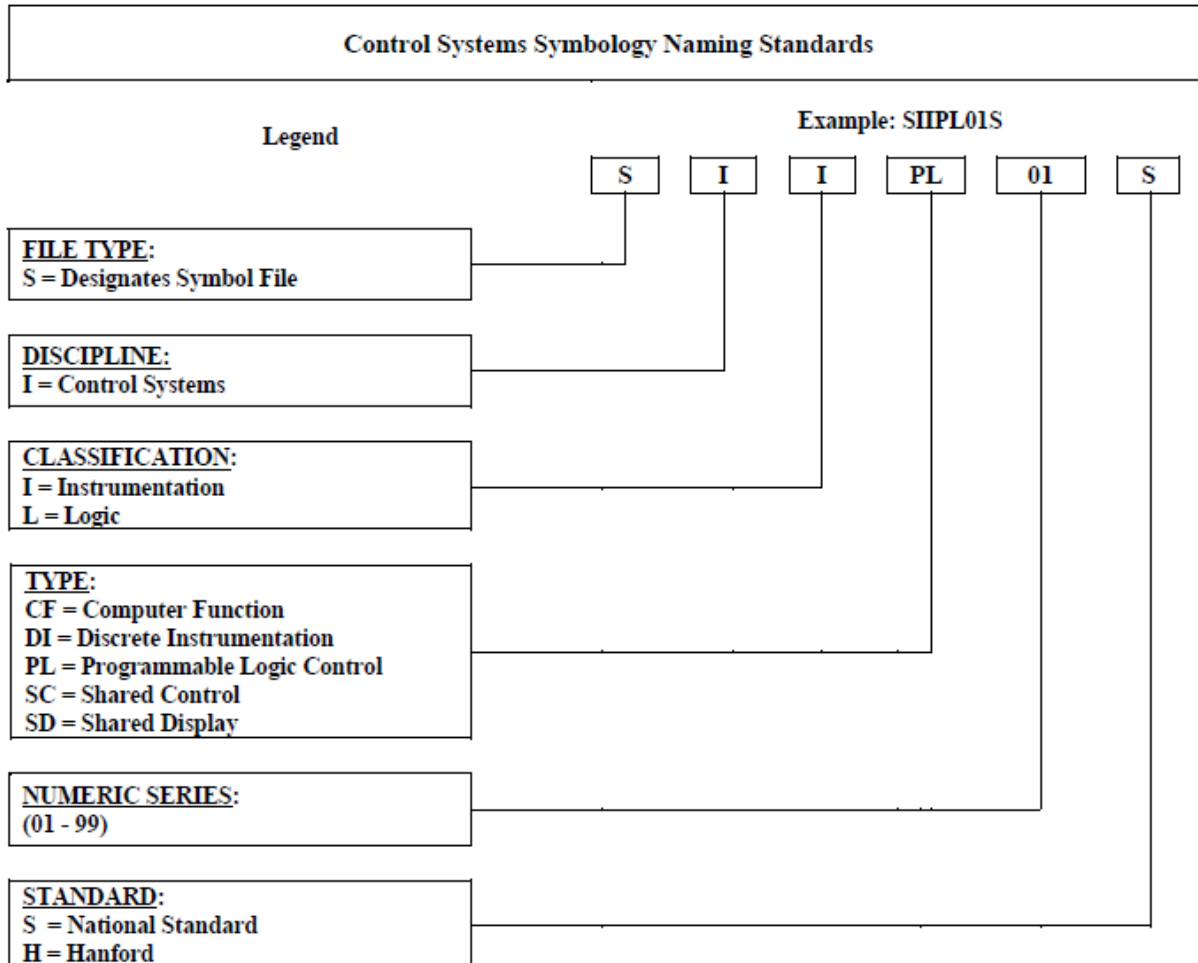
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Appendix E – Table 8

Table 8



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Appendix E – Table 9

Table 9 Electrical Symbolism Naming Standards				
Legend		Example: SER001S		
		S	E	RO0
				01
				S
FILE TYPE: S = Designates Symbol File				
DISCIPLINE: E = Electrical				
CLASSIFICATION: <u>Boxes</u> BJ0 = Junction BP0 = Pull BTO = Terminal <u>Conduit and Cable</u> CC0 = Conduit and Cable <u>Cathodic Protection</u> CP0 = Cathodic Protection <u>Elementary</u> EAR = Arrestor EBA = Battery EBR = Breaker EC0 = Coil ECC = Coax Conn ECL = Current Limiter ECM = Connector-Matted ECP = Capacitor ECR = Common Return ETC = Contact EDG = Earth Ground EDI = Diode EEE = Electronic EFG = Chassis Ground EFU = Fuse EIL = Indicating Light EMI = Meter/Motor EOR = Overload EPC = Programmable Controller ERB = Rectifier Bridge ERE = Resistor ERS = Reactor ESA = Switch Actuator ESS = Selector Switch ESW = Switch ETC = Thermocouple ETP = Test Point ETR = Transformer EVR = Varistor <u>Lighting</u> LF0 = Lighting <u>One-line</u> OL0 = General OLB = Breaker OLC = Coupling Cap OLG = Ground Fault OLH = Shunt OLM = Motor Control OLS = Switch OLT = Transformer <u>Outside Lines</u> OS0 = Outside Lines <u>Power and Control</u> PO0 = Power and Control <u>Receptacles</u> RO0 = Receptacles <u>Signaling Devices</u> SD0 = General SMD = Motion Detector SW0 = Motion Detector w/Switch				
NUMERIC SERIES:				
STANDARD: S = National Standard H = Hanford				

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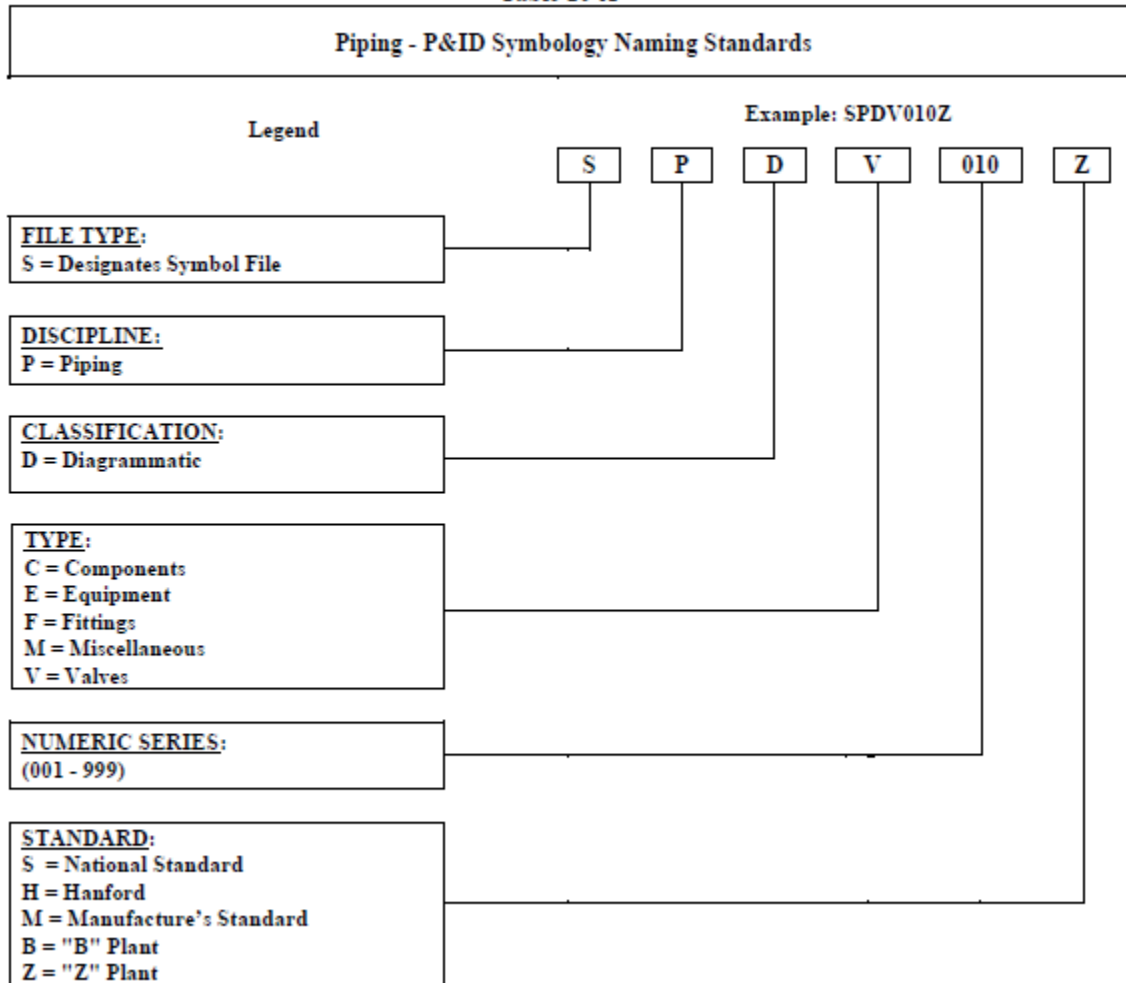
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Appendix E – Table 10-A

Table 10-A

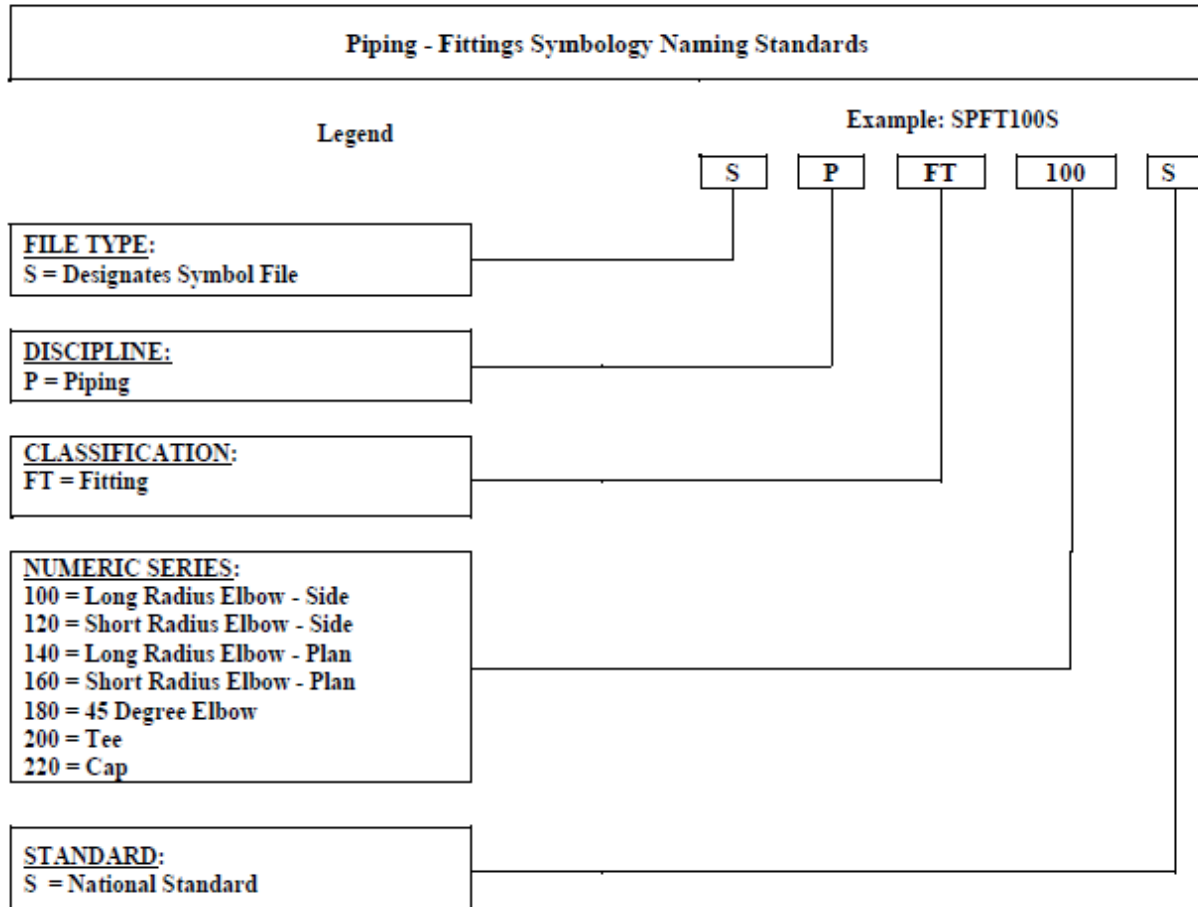


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Appendix E – Table 10-B**Table 10-B**

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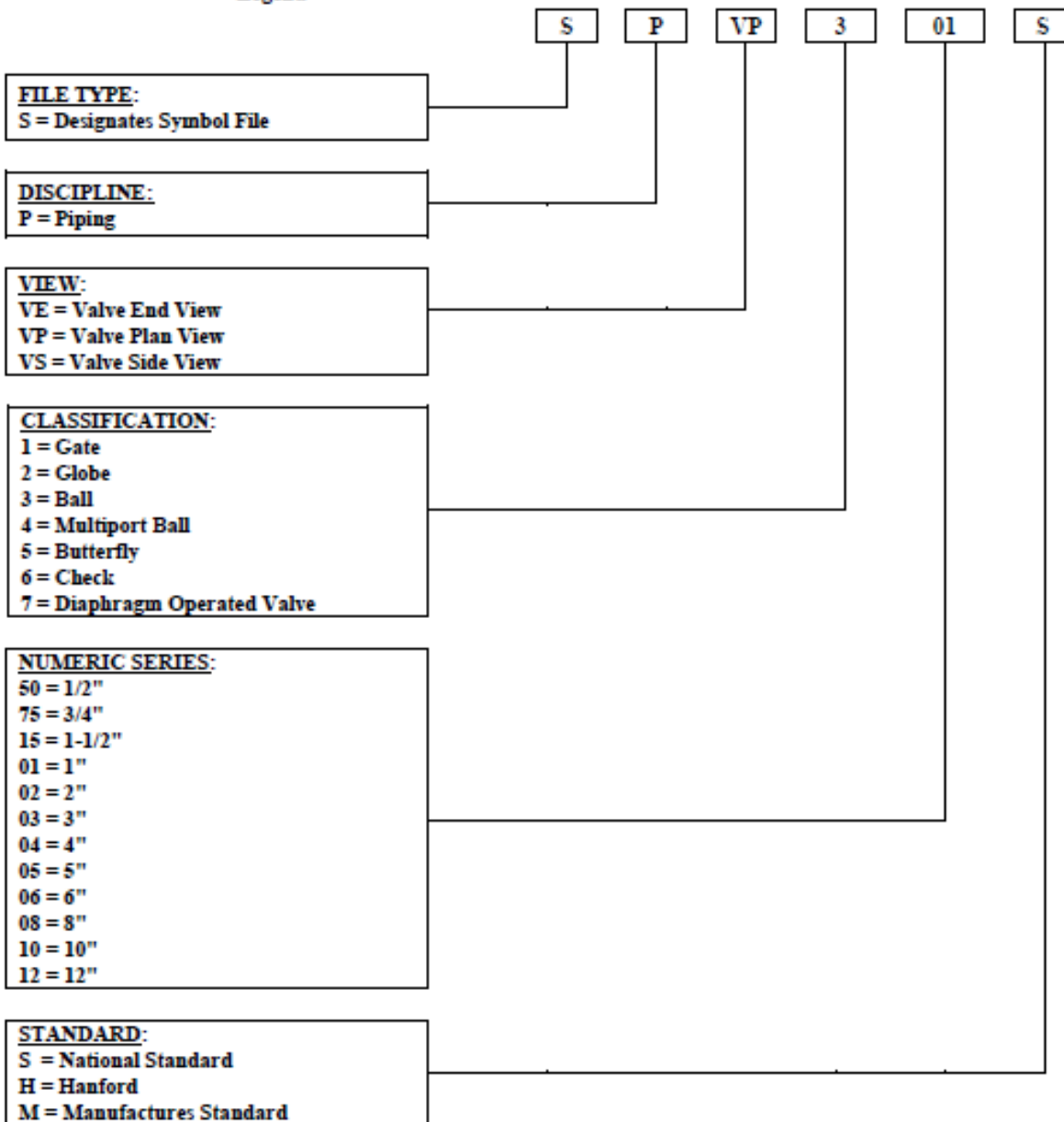
Appendix E – Table 10-C

Table 10-C

Piping - Valves Symbology Naming Standards

Legend

Example: SPVP301S



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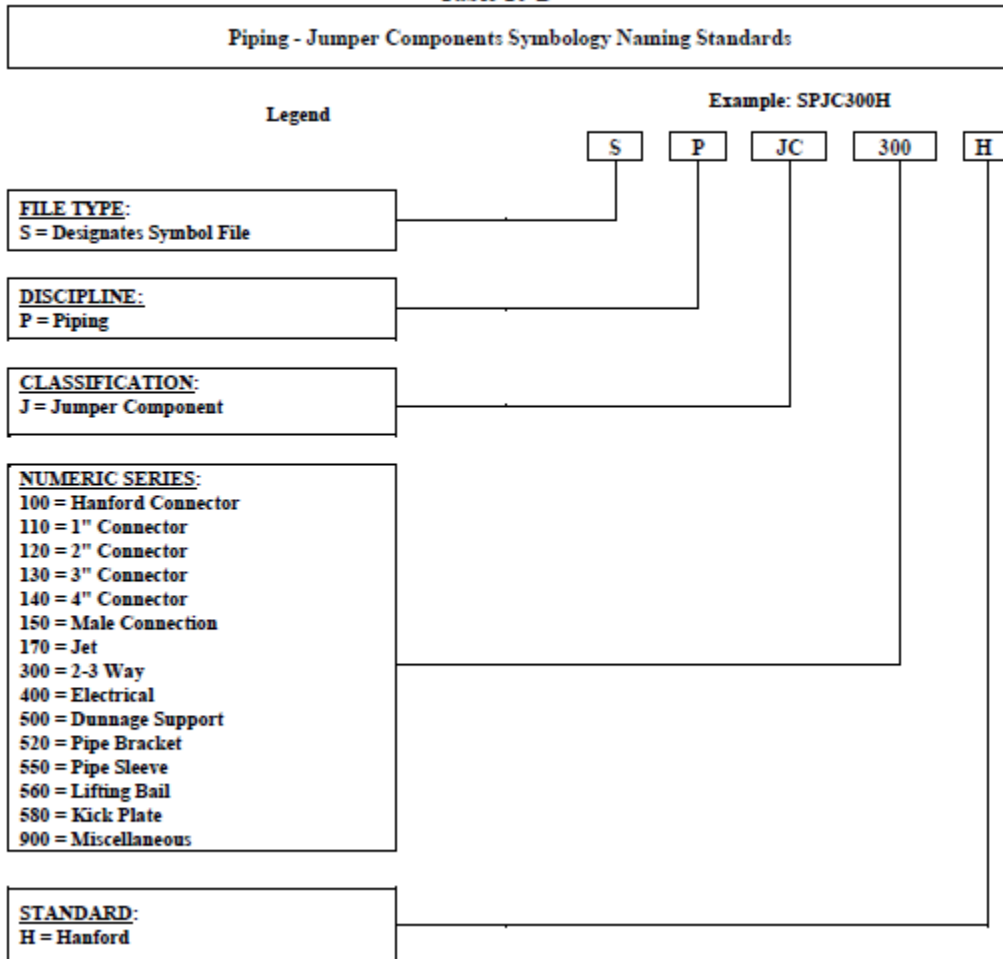
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Appendix E – Table 10-D

Table 10-D



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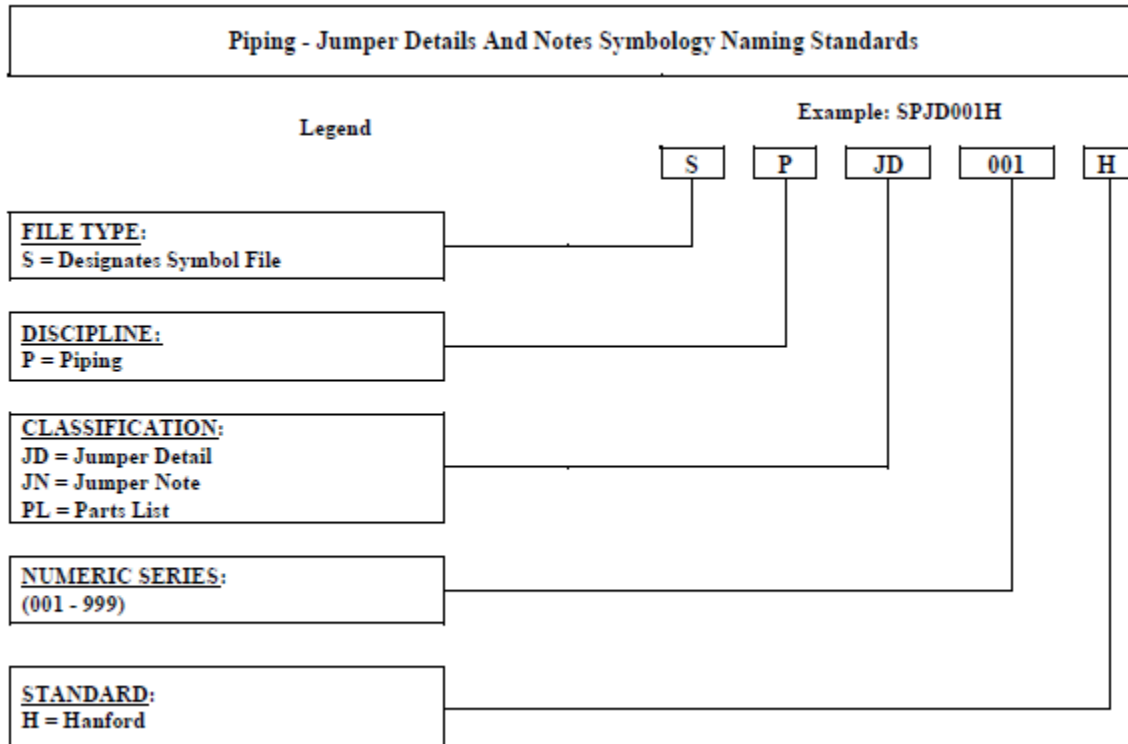
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Appendix E – Table 10-E

Table 10-E



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Appendix F. Parts/Materials List**A. Recommended Practices**

The following practices are industry proven and will assist in achieving the Parts/Materials List requirements listed in Section 3.22.

B. Arrangement

The Parts/Materials List should be arranged according to the following hierarchy:

- Arrangement/installation or assembly
- Subassemblies
- Detailed items
- Designed items
- Commercial/catalog items
- Hardware, e.g., bolts and nuts
- Material items

Three spaces should be provided between each category for future entries. See Example 1. The sequence of items in the Parts/Materials List may be broken when items added by drawing development, progress, or revisions have used all reserved spaces.

C. Item Number/Find Number System

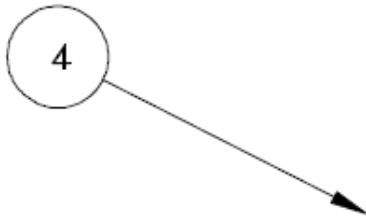
Items listed in the Parts/Materials List (assemblies, subassemblies, detailed items, commercial items, and material items) should be identified/located on the field of the drawing by item number as shown in Examples 2 and 3. Using this system allows the part number to be located in the Parts List and ensures that unique part numbering is maintained.

The item number is placed in a nominal 13 mm (.50") diameter circle with a radial leader pointing to the depicted item. See Figure 1a.

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Figure 1**Figure 1a****Figure 1b**

Views detailing parts or assemblies should always have the item number centered below the primary view in a nominal 16 mm (.63") circle. The nomenclature/description shown in the Parts List should always be used.

The lettering height should be 6 mm (.24") high and underlined. See Figure 1b.

All associated items are to be located on the primary view where possible. Duplicate item number call-outs required for clarification may be used but held to a minimum and identified as reference call-outs by adding "REF" beside the circle.

D. Multiple Item Call-outs

Where more than one item must be called out at one location, circled item numbers connected to one leader line may be stacked and quantities indicated as shown in Examples 2 and 3.

E. Items Not Requiring Pictorial Depiction

Items that do not require pictorial description for detail will be completely described, including dimensions, in the Parts/Materials List.

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Example 1. Parts/Materials List

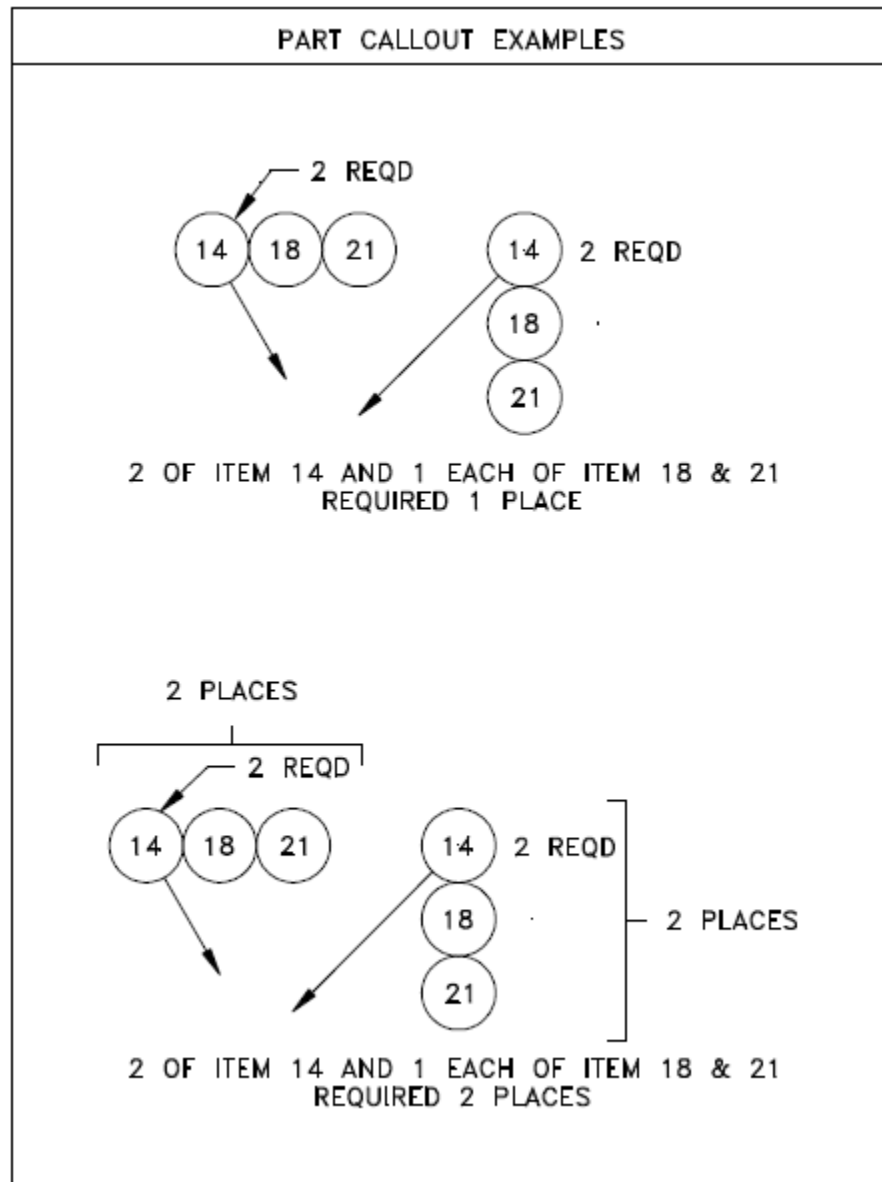
PARTS/MATERIAL LIST						
QTY	REQD	PART/DASH NUMBER	NOMENCLATURE/DESCRIPTION	MATERIAL/REFERENCE	SHT	ITEM NO
	<input checked="" type="checkbox"/>	-010	ASSEMBLY, GANTRY		1	1
	<input checked="" type="checkbox"/>	-020	SUBASSY, GRANTRY TRI-ADJUSTABLE		2	2
						3
						4
						5
1	3	-001	STABILIZER ROD	ASTM A36	2	6
	8	-002	HOLD DOWN CLAMP	ASTM A36	2	7
	1	-003	INSTRUMENT RACK	ASTM A36	2	8
	6	-004	MOUNTING BRACKET	ASTM A36	3	9
						10
						11
						12
	3	H-1-48149-020	SCAFFOLD ASSEMBLY			13
						14
						15
						16
	1	FR211-73	DUPLEX PUMP	MILTON ROY CO		17
	2	(SSS60TF8)	VALVE, BALL 12 mm FNPT, CL 150	ASTM A275 (WHITNEY)		18
						19
						20
						21
						22
	4		SCREW, SCHD CAP, HEX M6X1-4g6gX50 mm L	ASTM A574M		23
AR	AR		TUBING, TS, 101.6 mm X 101.6 mm X 6.35 mm (4"X4"X.25")	ASTM A500, GR B		24
AR	AR		PLATE, 6.35 mm (.25") THK	ASTM A36		25
2	1		CONTINUOUS HINGE, BLANK, W/PIN 1.52 mm (.060") THK X 38.1 mm (1.50") WIDE X 1828.8 mm (72") LONG	TP 304 SST		26

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Example 2. Single/Stacked Item Call-Outs

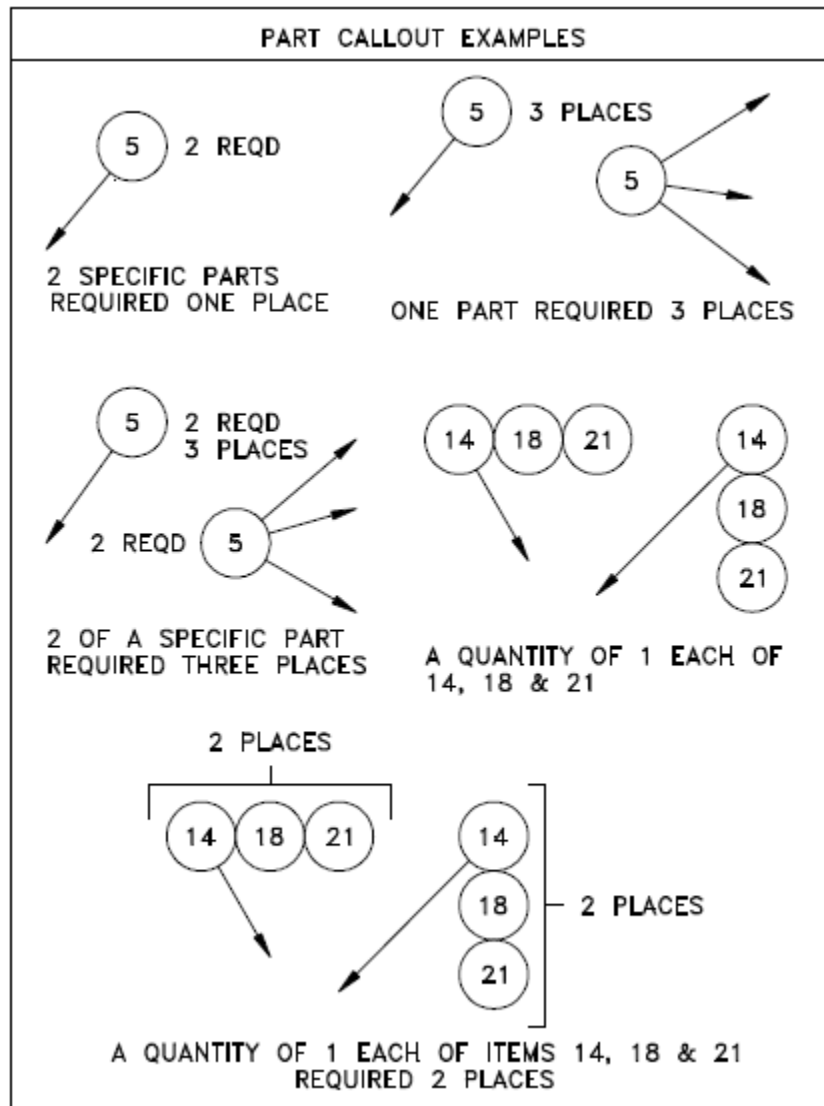
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Example 3. Single/Staked Item Call-outs



F. Parts List Vertical Spacing

To describe the part adequately, the Parts/Materials List vertical spacing may vary as required. Minimum spacing should not be less than 10 mm (.38") as shown by Example 1.

G. Applied Material

Applied material when required for fabrication, assembly, or installation, should be identified in the General Notes with any required application instructions, unless covered by a separate specification. See Appendix 7, Glossary.

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H. Optional/Alternate Parts/Materials

The words “or equal” are not to be used for parts or material substitution on drawings. Optional or alternate materials may be provided for on engineering drawings in the following ways:

- By referencing multiple brands/materials in the Parts List and/or in the field of the drawing, as applicable.
- By specific instructions for optional or alternate items placed in the General Notes.

J. Quantity - Quantity Required Column

The quantities (number of items required) are always for one arrangement, one installation, or one assembly only.

K. Counted Quantities

Counted quantities are to be accurate and described in customary trade units.

L. As Required (AR)

Use AR only when an exact quantity is not known or cannot be easily predetermined (e.g., piping, structural steel shapes, tubing, shims, gasket material).

M. Identifying Assemblies

For ease in identifying assemblies, place an X in the quantity (QTY) column where the assembly is placed. The X can be used to quickly identify the items required for the assembly and to indicate all the quantities in that column are for that assembly.

N. Reference Designation Column (Electrical, Electronic, and Instrumentation Applications Only)

This column should be used when unique identifiers are required for electrical, electronic, or instrumentation items. When used, the designator must correspond with the designator used in the field of the drawing. The width of the column is to be determined by the information required in the column. See Example 4.

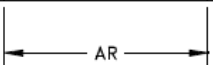
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Example 4. Parts/Material List Example (Reference Designation)

PARTS/MATERIAL LIST							
QTY	REQD	REF DES	PART/DASH NUMBER	NOMENCLATURE/DESCRIPTION	MATERIAL/REFERENCE	SHT	ITEM NO
-020	-010			INSTALLATION			1
							2
1		SW-EV-CS-2	10250T1371	SWITCH, OPR, 3 POSN, SPR RTN FR RIGHT	CUTLER HAMMER		3
3		SW-P-X37 SW-P-X36-1 SW-P-X36-3	10250T20KB	SWITCH, SELECTOR, 2 POSN MAINTAINED, 1 NO-1 NC CONTACT OIL TIGHT	CUTLER HAMMER		4
7		DS-11,13,16,18, 19,20,21	10250T37R	INDICATING LIGHT, 120 VAC, XFMR TYPE WITH 6V LAMP & RED LENS, OIL TIGHT, PRESS TO TEST	CUTLER HAMMER		5
2		DS-12,14	10250T37G	INDICATING LIGHT, 120 VAC XFMR TYPE WITH 6V LAMP & GREEN LENS, OIL TIGHT, PRESS TO TEST	CUTLER HAMMER		6
1		BQ-C5	G0-405	TOTALIZER, DIGITAL, 110 VAC WITH EXTERNAL RECTIFIER	MOORE INDUSTRIES		7
1		PS2	111-24-125	POWER SUPPLY, 115 VAC/24 VDC, 125 WATT	RONAN		8
1		LELL-X37	4130-0X-601	PROBE, LEVEL ASSY WITH CABLE PROBE, WITH ENCLOSURE LENGTH: 145.5"	ENDRESS HAUSER		9



O. Part/Dash Number Column

See Section 3.22.4 and Appendix G, Glossary.

P. Vendor Part Number

Vendor part numbers are the manufacturer's part numbers. See definition of Vendor (Supplier) Item in Appendix 7, Glossary).

NOTE: The manufacturer's part number is to be used for commercial items. When only a distributor/vendor, e.g., McMaster Carr, Hanford Stores, is known as a source, catalog numbers are noted as reference (in parentheses) in the Description Column or Material/Reference Column.

Q. Nomenclature/Description Column

Enter the basic name (a noun name) first. The noun name is a noun or noun phrase best establishing the basic concept of the item. It describes what the item is and what it is used for, not the material or method of fabrication. A compound noun or noun phrase is used only when a single noun is inadequate.

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Basic Name Example	
Bracket	(noun)
Piston	(noun)
Gear Box	(noun)
Terminal	(noun)

Use modifiers only when there is more than one type of the basic item used in the assembly (e.g., where two brackets are identified in an assembly, identified as bracket, mounting, and bracket, support).

R. Description (Vendor [Supplier] Item)

Specify parts to obtain the most cost-effective item. Where possible, use generic descriptions rather than brand names. The description is to specify characteristics that are sufficient for intended end use, but still broad enough in definition to permit open purchasing.

S. Hardware and Material Items

List basic names with required modifiers for fasteners and materials (e.g., SCH CAP SCR, 1/4-20-UNC-2A, etc). As required, list material items by form and size description (e.g., TUBE STEEL, 4 X 4 X 1/4; PLATE, 1/2 THK).

T. Material/Reference Column

List the controlling specification for the required material (e.g., ASTM, ACI) followed by the kind of material (e.g., SST, 6061-T6A, CS). Never use the word "COMMERCIAL" to indicate any acceptable grade. The words "ANY GRADE" may be used where the grade of material is not a design factor. Always identify the specific material grade when welding is required.

List names of supplier for commercial items, other separate documents controlling material, general notes, etc.

U. Sheet Column

For improved readability, always use this column to note where assemblies, arrangements, or detailed items are depicted on a multi-sheet drawing.

V. Item Number Column

Enter consecutive numbers starting with the numeral 1. An item number should always be used for each vertical space, including spaces left blank for future use.

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Appendix G Glossary

Altered-Item Drawing: An engineering drawing used to control and depict the alterations to a commercial item. An altered-item drawing reflects only the change and is not intended to show complete fabrication details.

Applied Material: Material that is not normally shown on the graphic presentation of a drawing (e.g., glues, adhesive, paint, cleaner). It may or may not have a manufacturer's identification number. Applied material normally is identified in the General Notes and its application explained, as required. Weld rod is excluded from this definition.

Arrangement/Installation Drawing: The top level drawing where multiple related details, assemblies, subassemblies, and certain connecting parts and/or instructions are shown depicting the final arrangement.

As Required (AR): A notation used when an exact quantity is not known or cannot be easily predetermined. The notation is placed in the "Quantity Required" column of the parts list.

Assembly: A term used to describe parts and/or subassemblies joined to complete a designed relationship.

NOTE: In view of the difficulty, in some cases, in establishing a clear distinction between the terms "assemblies" and "subassemblies," these two terms may be considered to have the same meaning and may be used interchangeably.

Brand Name: For the purpose of this standard, brand name implies the manufacturer, model, catalog name/number, trademark, or identifying name other than generic.

Component Number: A component number consists of letters and/or numbers that initially serve to uniquely identify a type of equipment/instrument. The component number identifies the relative location of the component on a schematic, flow diagram, one-line, or similar type of engineering drawing. After completion of fabrication/construction and installation, the component number serves as a key in various maintenance and operational activities.

Computer-Aided Design (CAD) Data Set: The CAD data set is the computer data file used to produce a hard copy engineering drawing.

Dash Number: A dash number is a unique numerical identification assigned to an item whose design is controlled by the drawing. When suffixed to the drawing number, the dash number provides a unique part number (see Part Number definition) for that item. A dash number is assigned where two or more items or an assembly are depicted on a drawing. The dash number will consist of three digits and be assigned as follows:

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- Assemblies. Every tenth number is reserved for assemblies (e.g., -010, -020, -030, -040).
- Parts. -001 for the first part and consecutively for all others, reserving every tenth number for assemblies (e.g., -001 through 009; -011 through -019; etc.).

Detailed (Piece Parts) Item: An individual item or units of material requiring specific part (dash) number identification because of traceability and accountability requirements for that item.

Engineering Drawing: An engineering drawing, including architectural and civil, prepared either manually or on a CAD system, that depicts by means of graphics, pictorial, and textual presentations, the form, fit, and function requirements of an item.

Fifth-Generation Copy Test: For the purposes of this standard, a fifth-generation copy test consists of making a full size copy (first-generation copy) from the original document, using a high quality copier. Then making a copy of the copy (second-generation); then a copy of that copy (third-generation copy), etc., until the fifth-generation copy is achieved. The graphics and text of the fifth-generation copy shall be clearly legible without magnification, special lenses, or editing.

Hard Metric Conversion: The process of changing measurement language to nonequivalent metric units, usually necessitating changes in the actual physical size and configuration of the part, product, or process that exceed those permitted by established measurement tolerance. Also see glossary for soft metric conversion, inch/pound measurement, and International System of Units (SI).

Hardware Item: Fasteners that may or may not require material identification (e.g., ASTM, and SAE).

Inch/Pound Measurement: Inch/pound measurements are units of the English measurement system (e.g., inches, pounds, degrees Fahrenheit, gallons). The formally recognized inch/pound units are the foot and the pound as defined by the National Institute of Standards and Technology (NIST).

Inseparable Assembly: Parts/material joined in such a manner that they are incapable of being disassembled without destroying the intended function of the item (e.g., weldments, bonded assembly).

International System of Units (SI): SI is the name of the modern metric measurement system approved by the 11th General Conference on Weights and Measures (CGPM) in 1960. It is adopted by worldwide standard setting organizations such as ISO, ANSI, German Institute of Standards (DIN), Japan Instrument Society (JIS), and Center for Studies of Nuclear Energy (CEN).

Preparation and CAD Data File Standards for Legacy Engineering Drawings

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Item Number: A number assigned to every line entry of a Parts/Materials Lists to tabulate items in the list. It is also used to locate an item in the field of the drawing and is not used for unique identification purposes.

Material Item: Material used in an inseparable assembly whose final configuration is contained within the configuration of that assembly (e.g., a weldment). Also, see Inseparable Assembly definition.

Part Number: A part number consists of letters, numbers, or combinations of letters and numbers that may or may not be separated by dashes and are assigned to uniquely identify a specific item. Part Numbers assigned to Hanford “H” series drawings consist of the drawing number plus a dash number.

EXAMPLE: H-3-60670-010

-010 is the Dash Number

H-3-60670 is the Drawing Number

Parts/Materials List: A tabulation of parts and/or material required for constructing, fabricating, or procuring the items depicted on a drawing.

Soft Metric Conversion: The process of changing measurement language from inch/pound measurement units to equivalent metric units within acceptable measurement tolerances without changing the actual physical size of the configuration of the part, product, or process. Also, see Hard Metric Conversion and Inch/Pound Measurement definitions.

Subassembly: An assembled unit designed to be incorporated with other units. See definition of Assembly.

Two-Way Traceability: Two-way traceability is cross-referencing existing engineering drawings affected by a new design or modification and vice versa.

Vendor Drawing: A drawing prepared by a vendor according to his/her drawing requirements that provides information on configuration, installation, maintenance, and/or operation.

Vendor (Supplier) Item: An item procured from an off-site manufacturer that has specific functional and physical features required to obtain the end product and has a specific part number identification assigned by the manufacturer.

X-Reference: This is an AutoCAD program feature that allows drawing data to be shared between data files. The shared data is not permanently part of the drawing until the X-Reference data is bound into the master (main) data file.